ROCK PRODUCTS

SEPTEMBER, 1948 — THE INDUSTRY'S RECOGNIZED AUTHORITY — VOL. 51, No. 9

Ralph S. Torgerson, *Managing Editor*

Bror Nordberg, *EDITOR*

Nathan C. Rockwood, *Editorial Consultant*

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David Mocine, Associate Editor
M. K. Smith, Assistant Editor
J. Sedlack, Assistant Editor

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"WE HEAR..."

September, 1948

Nearly 20,000,000 tons of raw steel have been lost as a result of major strikes since the beginning of 1946. In terms of finished products, this amount is almost equivalent to all steel supplied to the automobile industry in both 1946 and 1947.

* * * * * * * * * * *

New construction in 1948 will reach $18 billion, due mostly to higher costs, the Commerce and Labor Departments forecast. A previous estimate was $15.2 billion. Other estimates are that 950,000 privately-financed dwelling units will be started this year; private non-residential dwellings may total $3750 million, an increase of 20 percent over last year, and industrial construction will probably decline by 16 percent while commercial construction may rise almost two thirds. The Commerce Department also indicates an improved supply of major construction materials including cement, brick, lumber and steel items.

* * * * * * * * * * *

Asbestos is coming into its own in the kitchen as an aid to housewives in their dishwashing job. A new 20 percent asbestos fiber, 80 percent cotton towel will wipe dishes faster and dryer, National Cotton Council reports.

* * * * * * * * * * *

An employer cannot count on getting a State court to issue an injunction under the Taft-Hartley Act against unfair labor practices by a union. A State supreme court upholds a lower court in refusing an employer's petition to halt a union's picketing and secondary boycott. The court indicates that the Taft-Hartley law gave the National Labor Relations Board exclusive jurisdiction over unfair practices of unions and did not grant injunctive power to State courts.

* * * * * * * * * * *

Construction of a new Illinois and Mississippi Canal between Bureau, Ill., on the Illinois River, and Hampton, Ill., on the Mississippi River has been recommended by the Corps of Engineers District Office in St. Louis, Mo. Estimated cost of the 64-mile project is $99,759,000.

* * * * * * * * * * *

Farm income from sale of products and from Government payments has more than tripled, United States News reports. From $8,700,000,000 in 1939, it has risen to $30,000,000,000. Relatively, farmers have fared better in the three years since the end of the war than have city workers. The increase in farm income since the war is $7,600,000,000--nearly as much as the total farm income in 1939.

* * * * * * * * * * *

South Carolina legislature has completed action on a bill allowing 68,350-lb. maximum truck weights provided truck axles are spaced in accordance with state standards. Multiple axles are common on commercial vehicles, making pavement wear much less than might be expected from a vehicle's total weight.

* * * * * * * * * * *

Apparently the Association of American Railroads has decided that as long as the freight car shortage is continuing it might be a good idea to improve present equipment. At any rate, the A.A.R. Mechanical Division is going to take a look at what can be done to make the cars move faster. A program of laboratory and road tests will be conducted in cooperation with equipment manufacturers.

WE HEAR

Lime will continue to be used for lining athletic fields, according to Limeographs. A report by one football coach that lime used in lining athletic fields had been responsible for burns to his football players was proved to be erroneous. The Rules Committee of the National Collegiate Athletic Association decided, after receiving a letter of explanation from the National Lime Association, not to remove the word lime from the Rules Book.

* * * * * * * * * * *

Highway construction expenditures are expected to reach $1,500,000,000 in 1948, according to an estimate by the U.S. Department of Commerce. This compares with $1,154,000,000 in 1947. Highway maintenance totaled slightly more than a billion dollars last year.

* * * * * * * * * * *

Production of building products has increased to the point where the only materials likely to continue in tight supply through 1948 are millwork and items made of iron and steel. Production of many materials, including concrete block, has already reached the point where output has overtaken demand, according to an address by David S. Miller, president of the Producers' Council.

* * * * * * * * * * *

More than 68 pointed paragraphs on the safe operation of motor graders, bulldozers and scrapers are contained in a data sheet, D-Con I, being offered by the National Safety Council, Chicago, Ill. In addition comments on maintenance and operation for management and general operating precautions are given.

* * * * * * * * * * *

Industrial building contracts of $260,081,000, reported by Engineering News-Record in the first 14 weeks of 1948, are 21 per cent above their 1947 volume, while public utility building contracts rose to $58,816,000 from $34,036,000 a year ago, or 73 per cent. Forty-eight per cent of the new industrial construction, or $79,000,000, came from the backlog of proposed building.

* * * * * * * * * * *

Employers cannot legally sign a contract with a union binding themselves to hire only union members for certain positions provided the union supplies these workers immediately. A federal district court holds that one collective-bargaining contract with this provision violates the Taft-Hartley Act.

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A leader in 1948 highway construction, Pennsylvania made expenditures of $122,265,740 in the fiscal year ended May 31, representing the largest outlay of money for highways in any fiscal year in the history of the State Department of Highways. Of this amount, $73,534,435 was spent for construction, reconstruction, resurfacing and widening on the 41,000 mile system. However, maintenance costs showed a slight drop.

* * * * * * * * * * *

Cast iron that won't warp and buckle, or "grow", from repeated heating and coolings has been perfected by Battelle Institute metallurgists. The iron is of high-silicon content, silicon being the element which discourages the iron's "growth".

* * * * * * * * * * *

Some 192,000 housing units have been completed in Canada since January, 1945, according to the Dominion Bureau of Statistics, which stated that there were 77,000 completions last year, a gain of 10,000 over 1946. Increased activity was attributed to the greater supply of building materials including cement, asphalt shingles, asphalt rolls, rock wool batts and gypsum wallboard.

* * * * * * * * * * *

A nation-wide survey of high prices resulting from increases in the costs of production and transportation is being launched by the American Society of Mechanical Engineers. The survey is a result of the recent Supreme Court decision ruling out uniform basing point pricing.

THE EDITORS

★ ★ Editor's Page

More Effective Labor Utilization

SOME extremely interesting figures on the labor requirements to produce sand and gravel and ready mixed concrete were published by the Bureau of Labor Statistics, U. S. Department of Labor, in the June issue (designated Series No. R. 1924) of its *Monthly Labor Review*. Data were obtained for the 1946-47 period from plants that comprise a representative sample producing more than ten percent of each industry's output and broken down according to man-hours between excavation, processing, etc. Comparisons between labor requirements for the period under study and for 1937 disclose substantial labor reduction.

Analysis of the breakdown of man-hours required for excavation and processing by plant types would be beneficial to those who contemplate entering the industry, or plan to build or extensively modernize plants. It will show an established producer how his operation stacks up with the average, if nothing more, and might disclose where excessive labor utilization might become the object of corrective measures to place his plant in a more favorable competitive position.

Labor requirements in producing 100 tons of sand and gravel declined some eleven man-hours to 19.1 in comparing the two periods, which is one good reason the industry has been able to hold the line in prices.

High Production Yields Economy

Technological improvements and modernization of plants were credited in part with this reduction in man-hours but maintenance of nearly capacity production, in our opinion, was largely responsible for the improvement. In 1937, the industry had operated at only 45 per cent of its ability to produce. Really economical operation, as experienced operating men know, comes when a plant is performing at a uniform high level of production.

Modern equipment and intelligent layout of plant can contribute to minimizing fluctuations and intermittency of feed, to be sure, and thereby contribute to continuity of operation, but their contribution to efficiency has in many cases been absorbed in holding down costs (including labor requirements) while producing more refined products. During the past ten years the industry has undergone an evolution in specifications. It must produce more sizes of products, gravels with various percentages of crushed particles, cleaner products, retain or put more fines in concrete sand, etc., which mean more stages in production.

Unit man-hour requirements, significantly, showed little relationship to size of sand and gravel plants whereas, in the ready-mixed concrete industry efficiency is roughly in direct proportion to size. The study discloses that the location of deposits, their characteristics and the types of equipment in use have more bearing.

All of this points to keying the size of a plant to markets so that capacity operation can be maintained much of the time. The facts certainly verify the soundness of surge piles of unprocessed or partially processed materials between operating steps in a plant, the use of feeders where practicable to smoothen the fluctuations in flow and other developments which the more progressive operator has adopted.

Commenting a bit further on the report, plant operations accounted for 8.4 man-hours of work per 100 tons of sand and gravel produced and 7.8 man-hours were required in excavation, for the 1946-47 period. The latter figure should decrease in years to come as more operators adopt large earth-moving equipment and trucks for stripping and movement of materials.

Customers Get the Break

Apparently, the gains in labor utilization as outlined in this report and much of the other savings accomplished through efficiency by the sand and gravel industry are largely being passed on to the consumer. Price increases have been less than ten percent for the industry overall since 1941 which causes one to wonder if there are enough funds set aside to meet all costs in connection with depletion of deposits.

Capacity production has held unit costs down but do the prices charged reflect the true costs that will come later as a result of exhaustion of deposits which has proceeded at a proportionately high rate?

One of the reasons the petroleum industry shows big increases in income is the high cost of wildcat drilling to find new sources of crude oil and the increased costs incident to development. Good deposits of sand and gravel, particularly in and near metropolitan areas, are getting scarcer too. An acre of land costs much more than it did a few years ago and the costs of core drilling and opening test pits aren't what they were. All in the rock products industry might well give some thought to these items which might otherwise catch them unprepared.

Bror Nordberg

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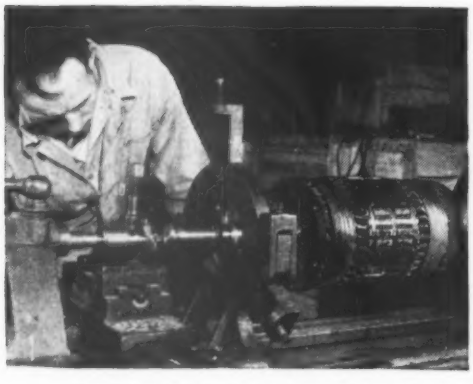

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Rocky's NOTES

Nathan C. Rockwood

How an Editor Feels To Be Honored While Living

IT ALL STARTED over a year and a half ago when friends in the National Lime Association decided it is just as appropriate to express a few kind words in behalf of a man's work and reputation while he is alive, as to send them to his widow or family after he had departed. Since then the National Sand and Gravel Association, the National Ready-Mixed Concrete Association, and most recently the directors of the National Crushed Stone Association have done something equally gracious.

For one of the introspectic (or introvert) type, it is difficult to express extemporaneously on the spur of the moment one's inmost thoughts and feelings. I trust I shall be pardoned for doing so here. The donors are entitled to it, and since as successful executives they must be practical psychologists, they may find something of interest.

It would be less than candid to say that these honors did not bring very great pleasure and deep gratification. I can not honestly say satisfaction, because of being one of that legion of individuals who is never satisfied or contented with his own accomplishments, past or present. Probably no introspectic person ever is, for his hindsight shows him too many things left undone. Nevertheless, there is genuine pleasure in knowing that accomplishments have been acceptable enough to be commended by contemporaries.

I have tried to say at the time that I expected and deserved no other rewards or honors than those that I have long enjoyed by being accepted as one of the industry, and by having the friendship and confidence of leaders in it. These really are the most priceless things in any man's life, and there are few of us, who as we grow older, do not come to realize the truth of this. It is well for mankind that most of us now live long enough to learn by experience as well as precept, for youth puts emphasis on material values rather than the intangible. Hence, the older we are the more we value friendships and long-time associations.

The closer we approach the inevitable, the more every thinking person must try to justify in his own mind the reasons for his having been here. There are so many ways to measure another person's successes or failures in life than an individual never knows by what particular yardstick his own work may sometime be judged. In a group of successful business men, it is oftenest the ability to make profits or acquire riches. With the same groups or others it may be outstanding ability in leadership. In the case of one who has neither of these faculties, it may be an unconscious capacity to make friends and win respect by what he writes and the contacts he makes.

Good Precedent to Follow

I hope that the precedents established by these national associations will be carried on, because there is no greater incentive to a normal man to do his best than to be told once in a while that he is doing a good job. If he is an honest workman, it does not increase his vanity but his self-esteem, which is quite different. There are executives who, apparently, are never pleased with anything their subordinates do, whose attitude is always one of criticism. There are also wiser executives who have learned that an occasional "pat on the back," when it is deserved, is more appreciated than a raise in salary. If there is such a thing left in American stream-lined industry as pride in individual workmanship, which originally was the keystone in our enterprise system, it should be rediscovered, encouraged and developed. It would help solve some of our most acute "labor problems."

Business executives too frequently overlook the importance of the human element in their organizations in their desire to get things done. One great advantage that the relatively small industry with owner management has over the big competitor is the exceptional opportunity to cultivate human relations. When this is fully appreciated the normal desire to grow bigger and bigger may well be tempered with the pleasure that comes from intimate and friendly relations with all "one's people," and the satisfaction that comes from being able "to run circles" around unwieldly large competitors. Usually, there are no politics in the small organization; and too often they are dominant in a large one. It has been well for our own outlook on industry problems that our associations have been with industries that are relatively small and individualistic, for probably our hope of retaining much of the American system of enterprise and industrial progress lies in retaining such kinds of industry.

Flowers for the Living!

Naturally then, we are wholeheartedly in favor of "flowers for the living." It is good for one's own soul; and if he has a family, it is good for them to know that at least some things the father has done are worthy of emulation. This seems especially important in these times, when "the old man" is apt to be regarded as altogether a back number. It is even a good thing for the younger men who are taking over work that you are giving up. Flowers for the "old man" may indirectly stimulate their pride of workmanship.

Moreover, we think it is a good thing for the journalistic profession, which, incidentally, is never particularly remunerative to those who make it a life work, at least business-paper journalism. Men make it a life work only because they love it. Most business paper editors try zealously to be helpful to their industries, and there is no greater distinction to achieve than to be accepted by the industries they serve as an integral part of them, and as such to enjoy the confidence and friendship of the leaders in those industries. To hand such an editor a few flowers on occasion is to spur him to greater efforts—and it may help publishers to appreciate the value of editorial services. So, while reticence in the character of New England ancestry may have prevented the recipient from bubbling over with emotion at the time these honors were bestowed, be assured that they are appreciated and that I am deeply grateful for having received them. I trust that circumstances will permit me to write and to keep in contact with you as long as we both live and as long as you may desire it, and as long as what I write may be worth reading. This has been my life work and it has been most interesting and enjoyable. Indeed life has been kind to me in many ways, especially in these long friendships and associations with some of the finest men that any walk of life or any industry could have produced.

This, then, is not necessarily a valedictory but an expression of some of the thoughts that did not seem to come readily at the proper time and place. My forte, if I have one, is with a pen and not with oratory. Since neither pen nor ideas have as yet run dry, I propose to keep both working. In this critical period in the history of our country in general, and in that of the American free enterprise system in particular, it is good to be alive and have a hand in developments. If what we may contribute prove helpful in a small way in maintaining faith in American institutions, it will be a pleasure and an obligation to have written it.

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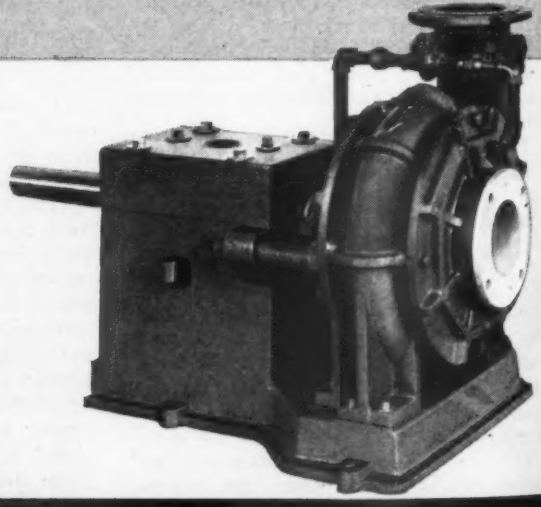

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the Personal Side of the news

Assists Promotion Director

W. G. KAISER, manager of the Farm Bureau, Portland Cement Association, Chicago, Ill., has been appointed assistant director of promotion. He will

W. G. Kaiser

work with W. D. M. Allan, director of promotion, giving special attention to advertising, public relations and literature production activities of the Association.

T. E. LONG, assistant manager of the Farm Bureau, succeeds Mr. Kaiser as manager.

Mr. Kaiser is nationally known as a leader in agricultural engineering. In 1946 he was awarded the Cyrus Hall McCormick medal of the American Society of Agricultural Engineers. He holds a bachelor's and a professional degree in agricultural engineering from Iowa State College, and is a member and past president of the A.S.A.E. and a member of the American Concrete Institute. He has been in charge of the Portland Cement Association farm promotion since 1917.

Mr. Long joined the Association in 1947. He is a member of the A.S.A.E. and a graduate agricultural engineer from the University of Nebraska. He served on the staff of the North Dakota Agricultural College from 1939 to 1944, at which time he joined the agricultural engineering department of the Republic Steel Corp.

Chief Chemist

J. R. TONRY, formerly chemist at the Martinsburg, W. Va., plant of Standard Lime and Stone Co., Baltimore, Md., has been appointed chief chemist at the Portland, Colo., plant of Ideal Cement Co., Denver, Colo. A graduate of the University of West Virginia, Mr. Tonry has been in the cement business for the past ten years. ROBERT KELHER has been named plant chemist at Portland, Colo. He was formerly on the staff of the Central and Research Laboratory at LaPorte, Colo., which he joined in 1946.

Establishes Own Consultant Service

W. F. MURRAY, formerly executive assistant and manager of the Oregon properties of the Pacific Portland Cement Co., San Francisco, Calif., has established a consultant and engineering service in Coldwater, Mich., to handle projects in the cement and allied industries and in the construction field. In 1919 Mr. Murray joined the Wolverine Portland Cement Co., Coldwater, Mich., as mechanical engineer, becoming director and executive vice-president. He resigned in 1942 to accept the position of vice-president and general manager of the Wabash Portland Cement Company.

Operations Manager

MONROE RULE, formerly manager of the Saltville, Va., plant of the National Gypsum Co., Buffalo, N. Y., has been appointed manager in charge of operations at the Kimballton, Va., lime plant. Mr. Rule has a background of 25 years of experience in the gypsum and lime industry and has been with the company since 1942. He previously served as plant engineer at the Fort Dodge, Iowa, plant.

Elected President

CLAUDE K. BOETTCHER has been elected president of Ideal Cement Co., Denver, Colo., to succeed his father, Charles Boettcher, who passed away recently. CRIS DOBBINS, formerly vice-president and general manager, has been named to succeed Claude Boettcher as executive vice-president and will continue as general manager. GEORGE W. BALLANTYNE will assume the position of treasurer in addition to his duties as secretary. Other officers include Harry O. Warner, vice-president and general sales manager; M. O. Matthews, vice-president and general manager of the southern division, and Oakley F. Counts, comptroller. Henry C. Van Schaack, Denver realtor and banker, and Arthur G. Rydstrom of New York, have been elected to the board of directors.

Claude K. Boettcher

Cris Dobbins

Sales Representatives

THURMAN MANLEY, manager of the Nashville, Tenn., office of Universal Concrete Pipe Co., Wheeling, W. Va., has been promoted to sales representative for middle Tennessee. He will be succeeded as manager by SAM HIRSBRUNNER of Nashville, who will be assisted by LESLIE WATERSON of Manchester, Tenn. FRED P. LAMON, formerly with the Alabama Highway Department, has been appointed sales representative for the Decatur, Ala., territory.

Technical Director

GUSTAVE HEINEMANN, chief chemist at the Corpus Christi, Texas plant of the Southern Alkali Corp., has been appointed technical director in addition to his duties as chief chemist. Mr. Heinemann formerly served as a chemical engineer at the Barberton, Ohio, plant of the Pittsburgh Plate Glass Co., Pittsburgh, Penn.

Plant Manager Retires

C. A. SWIGGETT, manager of the Iola, Kansas, plant of Lehigh Portland Cement Co., Allentown, Penn., has retired after 31 years of service with the company. He will be succeeded by ROBERT JONES, assistant manager of the Buffalo, N. Y., plant.

Consultant Retires

A. F. MILLER, consulting engineer for the Marquette Cement Manufacturing Co., Chicago, Ill., has retired after 21 years' association with the company. Mr. Miller has participated in all major plant improvements and extensions undertaken by the company. He was responsible for the designs and mechanical features of the No. 2 cement mill and the No. 2 crusher plant at Oglesby, Ill., the packing plant and the storage facilities, also the cement plant, silos and packing plant at Des Moines, Iowa. Mr. Miller developed the system of dry material homogination and mix control used at the Cape Girardeau, Mo., plant and engineered the improvements now being made at Nashville and Cowan, Tenn. He also designed the sodium aluminate and deflurinated phosphate plants built and operated at Oglesby during World War II. The cement plant at Chihuahua, Mexico, and the air quenching clinker cooler installations at Oglesby and Cape Girardeau are also some of Mr. Miller's work. He has done considerable research into the production of dry ice from kiln gases and the production of rock wool from cement making materials.

Mr. Miller's plans for the future are indefinite but he does plan on taking an extended vacation, after which he probably will devote some time to developing labor saving devices and methods for packing and loading cement.

Industrial Relations Consultant

VINCENT P. AHEARN, executive secretary of the National Sand and Gravel Association and the National Ready Mixed Concrete Association, Washington, D. C., has been appointed by President Truman as executive director of the National Conference on Industrial Safety which will be held in Washington on September 27 to 29, 1948. He has also been appointed industrial relations consultant in the Economic Cooperation Administration.

New Officers

J. B. GANDER has been elected president and chairman of the board of the Mississippi River Sand and Material Co., St. Louis, Mo. James J. Fitzgerald was elected vice-president; Michael Hendy, treasurer; Carl R. Moehlenhoff, secretary; and Oscar Hebenicht and G. H. Oetting, directors.

Manages Sand Firm

MRS. MARIE CLARK has been named secretary and manager of the Crystal Sand Co., Moundsville, W. Va., according to an announcement by George A. Bailey, president. Mrs. Clark, who has been with the concern for many years, succeeds the late Granville S. Snodgrass, who managed the company for more than 25 years before his death early this year.

Chief Engineer

JOHN C. KING, formerly senior engineer with the International Engineering Co., Inc., Denver, Colo., has been appointed chief engineer of the Prepakt Concrete Company. Mr. King is an associate member of the American Society of Civil Engineers, and a member of the American Concrete Institute and the Colorado Society of Engineers.

Assists President

HERBERT W. POPE, formerly assistant sales manager for the Lawrence Portland Cement Co., New York, N. Y., has been appointed assistant to the president, James H. Ackerman, with headquarters in New York City.

OBITUARIES

DANIEL A. HAMILTON, president and manager of Gallagher Brothers, Hamilton, Ont., Canada, lime and stone firm, died July 7. He was 82 years of age.

ELMER H. LANGE, president of the Con-o-Lite Vault Co., Cincinnati, Ohio, died July 2 after a short illness. He was 57 years of age.

WILLIAM G. MENNE, president and general manager of the Quincy Sand Co., Quincy, Ill., died July 16 after an illness of a year. He was 61 years old. Mr. Menne had taken over the sand business from his father who was the founder. His brother Henry was associated with him in the business.

WILLIAM BRADFORD JONES, president of the Duquesne Slag Products Co., Pittsburgh, Penn., a subsidiary of Standard Slag Company, passed away June 30. For years Mr. Jones was a salesman for Standard Slag Co., covering Mahoning, Trumbull and Ashtabula counties in Ohio. He was also vice-president of Midland Slag Co., another Standard subsidiary, with headquarters in Youngstown, Ohio.

ALVA MARTIN CULP, superintendent of Miller's Sand and Gravel Co., Columbus, Ohio, until his retirement in March, 1947, died July 5 at the age of 57.

CARL C. WHITACRE, owner of a sand and gravel pit near Xenia, Ohio, passed away July 13 after suffering a heart attack while working in the pit. He was 64 years old.

SAM D. RONERY, associated with the Harris Turner Sand and Gravel Co., Florence, S. C., died July 5 after an illness of several weeks. He was 41 years old.

MAYNARD D. SMITH, former contractor, died at Port Huron, Mich., after a brief illness. The A. J. Smith Construction Co., founded by his father and later operated by Mr. Smith, built many of Detroit's automobile plants. Mr. Smith was also active in establishing the Port Huron, Mich., plant of the Peerless Cement Company.

DON G. SAVAGE, vice-president and general sales manager of The Thew Shovel Co., Lorain, Ohio, died July 25 of a heart attack at his home in Lorain. He was 50 years old. Mr. Savage's death came only ten days after his promotion to the vice-presidency. He was also a member of the board of directors and had been general sales manager since 1935. Previously, he held the position of Southeastern Sales Manager with headquarters in Atlanta, Ga.

JAMES PRESTON HOSKINS, director, assistant secretary and assistant treasurer of the General Portland Cement Co., Chattanooga, Tenn., died August 2 after a brief illness. He was 84 years old. Mr. Hoskins became associated with the Signal Mountain Portland Cement Co., Chattanooga, (now a division of the General Portland Cement Co.) as a director in 1923 and ten years later was made assistant secretary and assistant treasurer of General Portland Cement Company.

FRANK C. THOMAS, general manager of the Standard Lime and Stone Co., Martinsburg, W. Va., was one of three men killed when a small private plane in which he was riding crashed on a mountain near Martinsburg. The other occupants of the plane were George Baker Treide, prominent Baltimore attorney, and E. C. Parkinson, manager of the Martinsburg flying service and the pilot of the plane.

FREDERICK C. FIELD, for 23 years asphalt chemist with The Asphalt Institute, New York, N. Y., passed away on June 29. He was 73 years of age and had been ill for several weeks. Mr. Field joined The Asphalt Institute (then the Asphalt Association) in 1924 and was appointed chemist in the laboratory to work with Prevost Hubbard, chemical engineer. Their first project was the invention of the Hubbard-Field stability machine.

ARTHUR F. BOSS, special representative for the Medusa Portland Cement Co., Cleveland, Ohio, died suddenly on July 22. He was 61 years old. Mr. Boss started his career in the cement industry with the Universal Atlas Cement Co. about 25 years ago, and later became associated with the sales department of the Cleveland Builders Supply Co. where he remained until he joined Medusa Portland Cement Co. in 1930.

RAYMOND W. DULL, a consulting mechanical engineer in Chicago for 50 years, died recently at the age of 74. Mr. Dull was a consulting engineer serving the sand and gravel industry and inventor of the Dull conical screen. He was also the author of several books on mathematics and a contributor to science magazines. He later became consulting engineer for Link-Belt Company.

Bureau of Mines Appointees

WILLIAM J. FENE, formerly assistant chief of the Coal Mine Inspection Branch of the Bureau of Mines, Washington, D. C., has been appointed assistant chief of the Health and Safety Division.

MARLING J. ANKENY, who has been special assistant to the chief of the Health and Safety Division and the chief of the Coal Mine Inspection Branch, has been appointed chief of the Coal Mine Inspection Branch. Both Mr. Fene and Mr. Ankeny succeed to positions formerly held by John J. Forbes, who became chief of the Health and Safety Division upon the recent retirement of Daniel Harrington.

New Directors

PHILIP NELSON AND CLAYTON HOLLINGER have been elected directors of the W. H. Loomis Talc Corp., Gouverneur, N. Y. E. D. Magnus, president, confirmed plans for company expansion. Also confirmed was the report that the company plans to sell the seven farms in or near Fowler Village which were acquired by the late W. H. Loomis for mineral rights.

Injured in Plane Crash

ART MILLER, JR., manager of the Fostoria Concrete Products Co., Fostoria, Ohio, sustained internal injuries recently when the plane he was piloting crashed on a take-off from Wooster, Ohio, airport. He is reported to be somewhat improved although his condition still is critical. David Williams, a bookkeeper for the company, was a passenger in the plane but was not critically injured.

Joins Concrete Firm

GEORGE A. MANSFIELD has resigned his position as technical service director and division sales manager of the Huron Portland Cement Co., Detroit, Mich., to become associated with William Moors Concrete Products, Fraser, Mich. Mr. Mansfield advises that this change was made following the advice of his physician to eliminate extensive travelling.

Director of Public Relations

DAVID A. WHITE, JR., formerly public relations officer for the Buffalo Regional Office of the Veterans Administration, has been appointed director of public relations for the National Gypsum Co., Buffalo, N. Y. STEPHEN F. TUCKER has been named manager of gypsum advertising.

Named Engineer

DAVID H. MILLER, assistant electrical superintendent and expediter during the erection of the new Noralyn, Fla., phosphate plant of International Minerals and Chemical Corp., Chicago, Ill., is now serving the company as an engineer in phosphate operations.

Vice-President Retires

J. A. CREW, vice-president of Central Silica Co., Zanesville, Ohio, has retired from the company after many years of service. Mr. Crew will be remembered as an ardent golfer by those who attended conventions of the National Industrial Sand Association.

Appointed President

N. J. REDMOND, secretary-treasurer of the Blue Diamond Corp., Los Angeles, Calif., has been appointed president of the company, to succeed the late W. J. Van Valkenburgh.

Transferred

J. J. MALONEY, JR., has been transferred to the sales division of the explosives department in Norton, Va., of E. I. duPont de Nemours & Co., Wilmington, Del.

Works Manager

H. LORENZ WALDTHAUSEN, JR. formerly with the Kaiser Co., Oakland, Calif., has been appointed works manager of the Blue Diamond Corp., Blue Diamond, Nev.

Wins Award

PAUL PULSE, II, a graduate of Hillsboro High School and son of Mr. and Mrs. Paul Pulse, Hillsboro, Ohio, has been awarded the annual Ohio Process Limestone Scholarship Award of $150.

Wedding Bells

GILBERT G. HILL, JR., son of G. G. Hill of the G. G. Hill Sand and Gravel Co., Dexter, Mo., was married recently to Miss Mary Lynn Darby. Mr. Hill is associated with his father in the sand and gravel business.

Resigns

WARREN H. LEONARD has resigned as vice-president and general manager and director of the Riverside Cement Co., Riverside, Calif.

Named Agent for Cement Subsidiary

OLYMPIC STEAMSHIP CO. OF SEATTLE has been named agent for the S.S. Permanente Silverbow and the S. S. Diamond Cement, it has been announced by W. A. Marsh, assistant general manager of Permanente Steamship Corp. which owns both vessels. Permanente Steamship Corp. is a wholly owned subsidiary of Permanente Cement Co. Its Diamond Cement operates between Seattle and Alaska while the Silverbow includes Honolulu in its coastwise schedule.

Director's Meeting N. A. L. A. Association

AT its recent Board of Directors meeting held in Chicago, Ill., the National Agricultural Limestone Association, Inc., represented by 21 members from 15 States, opened the business session with a treasurer's report followed by the Secretary's report of activities in connection with the promotion of legislation which affected the Industry. Particularly concerned was the Agricultural Conservation Program and the possibility of securing percentage depletion for the Industry.

After a thorough consideration of Association policy, the Directors voted to continue the type of aggressive legislation promotion which the Association has been pursuing. An advertising circular which had been released to members was discussed, and it was voted to further develop advertising which members can use locally.

The Percentage Depletion Committee reported progress in enlisting Congressional support for percentage depletion and this was further promoted during the Special Session of Congress and will be taken up in January when a bill to provide for percentage depletion for certain industries will be re-introduced.

Plans were made for the Annual Convention which will be held January 18, 19 and 20 at the Hotel Statler, Washington, D. C. The dates are of particular significance in that the new President will be inaugurated at noon, January 20. N.A.L.A. has added 45 new members since the last January meeting, Robert M. Koch, secretary, announced.

N.C.S.A. Short Course

NATIONAL CRUSHED STONE ASSOCIATION, Washington, D. C., has announced its Third Short Course to be held February 2-5 in Washington. Topics to be discussed include: Gradation of Aggregates for Maximum Density; Proportioning of Concrete-Structures, Pavements, Dams; Air Entrainment; Alkali Reactive and "Incompatible" Aggregates and their Effect on Concrete; Bituminous Binders, Mixtures and Surface Treatments, and Stone for Use in Sewage Disposal. Laboratory demonstrations will be given on aggregates, concrete and bituminous concrete.

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SOUTHWESTERN PORTLAND CEMENT CO., Los Angeles, Calif., may construct a mill at Bernalillo, N. Mex., as a partial remedy to rising cement costs in the Albuquerque area, a report states. M. Eugene Sundt, Albuquerque Gravel Products Co., is urging community support for a closer supply of cement as a cure to cement costs which he says have risen 43.7 percent since 1945.

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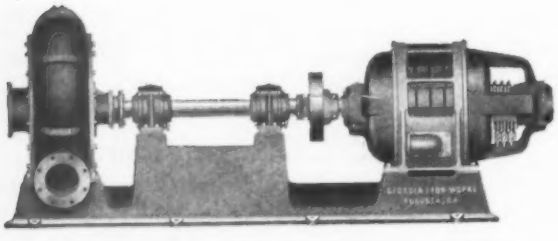
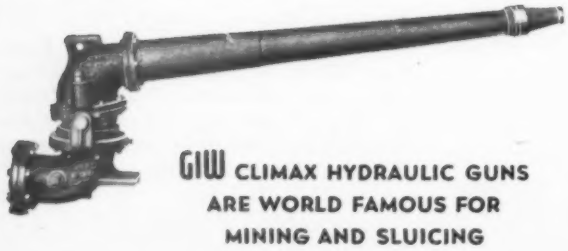


RIGHT HAND BOTTOM DISCHARGE SAND AND DREDGE PUMP WITH MOTOR



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2. Georgia Iron Works makes sand and dredge pumps, hydraulic guns and related parts, and nothing but these items. The rugged dependability of GIW pumps is a matter of record since 1891. GIW parts are made to wear and wear under severe tests. Enjoy the satisfaction of using the tried and true GIW pumps.

3. GIW pumps are the lowest cost pumps of proven quality obtainable. Replacement parts cost much less. Any way you figure, durable GIW pumps do the job efficiently and at lower cost. May we take care of your requirements?

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LABOR RELATIONS TRENDS

Human Factors in the Interpretation of Union Contracts

By NATHAN C. ROCKWOOD

NOVELISTS SEEKING LOCAL COLOR may some day look into the files of reports or decisions by arbitrators called in to settle "grievances" of workers arising from their alleged interpretations of union or collective bargaining contracts. They will find plenty of "exhibits" of human nature in the raw, and characters drawn from real life. Perhaps, no other reading gives a better picture of the trials and tribulations of modern industrial management. Since the same human traits must still be there under socialism or communism, reading these reports should prove to anyone with a little intelligence that socialism would not help. There have to be managers under any kind of successful social organization, and society's problems are not eased by circumscribing managerial authority beyond limits, which we seem already to have passed.

The case we are discussing concerns a Michigan portland cement company, and is typical of the kind of problems that constantly arise even under most carefully drawn labor agreements. The majority of the plants in the cement industry are organized by an A. F. of L. union, and there have been very few controversies between labor and management which reached the courts or arbitration, judging by the published record. The present case involves a C.I.O. union—the United Stone and Allied Products Workers of America, United Cement and Quarry Workers Industrial Union Local.

Job Classification

The company had three classifications of machinists A, B and C, with only 14 employes in all three. Class A machinists were of course those having the highest skill, required for precise work. When there wasn't enough of this kind of work to keep them occupied, the Class A machinists were assigned to rougher work, ordinarily done by Class B machinists. However, they retained, as is customary practice, their Class A wage rate for any kind of work they were called upon to do.

One Class B machinist who worked with these Class A machinists on some of this lower grade work decided he should be rated Class A, and the union espoused his cause. Since the company management would not concede this contention, the matter went to an arbitrator, along with other controversial matters to be mentioned later. The contract provided for this eventuality with an arbitrator appointed by the American Arbitration Association, his decision to be binding on both parties. Such arbitration has become a profession and usually, as in this case, high grade men are available. Primarily, of course, their job is to interpret the contract clauses as they are written, but some are greater sticklers for exact word meaning than for intended meaning.

In this case the arbitrator ruled that the unions, (and the employe's) contention had failed "to recognize an important industrial fact—that an employe's classification is not controlled by the job to which another is temporarily assigned, but rather by his own regularly assigned tasks and the skill he is required to bring to them. And, the rate of pay an employe is entitled to receive is the rate of the job he was hired to perform and the skill required in its performance, rather than the employe's personal qualifications. If it were otherwise, a sweeper, for example, might demand the pay of a machinist merely because he was qualified to do machinist's work.

"This does not mean, of course," the arbitrator continued, "that an employe may be required to perform the same work and possess the same skills required in a higher classification at the lower classification rates. When this occurs, the principle of equal pay for equal work becomes applicable and a reclassification into his proper niche is warranted. This, too, is the reasonable intent of the contract. Required, then, is a determination whether on the evidence submitted, the complaining employe was in fact required to and did perform the duties of a Class A machinist."

The employe was able to present evidence of only 11 hours' work in a 3½-month period, which could properly be considered as Class A machinists' work. The arbitrator concluded: "The burden of proof on a question of job reclassification is on the employe who claims that he was required to perform work in a higher classification. * * * The complainant is not entitled to reclassification."

Refusal to Work Overtime

The company received coal and shipped cement by lake steamships—some of their own and others. The shaft of the unloading mechanism on a ship not belonging to the company broke while unloading coal. The four members of the night repair gang, which took over from the day shift at 4:30 p.m. and worked to 1 a.m., were asked to continue on overtime until the job was completed. They refused to do so, and the company gave them a 5-day layoff, later reduced to 2 days, as a disciplinary measure.

The union contended no employes could be compelled to work overtime under their contract, and moreover, these employes were requested to work outside the mill on a boat not owned by the company. The union asked that the penalty be set aside and the four employes reimbursed for time lost.

The arbitrator found: "In the past, with one exception, the employes had worked overtime when requested, without objection; those involved in this dispute worked no overtime that week. The request to work overtime on this day was due to an emergency and was made two hours in advance of quitting time. As soon as the employe's refusal to work was learned, the management made a sincere effort to obtain other workers to complete the repairs (by going to their homes in the middle of the night) and succeeded only after some delay, which could have been avoided if the repair crew had remained. The machinists, who were required to make new parts for the mechanism, worked the necessary overtime. Except for the probable reason that they wished to test out the company's right to compel them to work overtime, the repair crew offered no reasonable excuse for refusing to do so. Under all these circumstances, the employes' refusal to work overtime on the night in question was clearly unjustified."

What a Contract Is Not!

The following quoted paragraphs from the arbitrator's report are *very important* to all employers who make collective bargaining contracts: "Implicit in every employment relation-

(Continued on page 67)

Percentage Profits-Sharing Plan Appealed

• The profits-sharing plan described in our July issue, declared fair and reasonable and within the law as laid down by previous U. S. Supreme Court decisions, when decided by the U. S. Circuit Court of Appeals, Sixth Circuit, Cincinnati, Ohio, recently, is being appealed by the employes involved to the U. S. Supreme Court.

These employes continue their contention that all the profit-sharing bonus should have been added to straight time only, and the "regular rate" of pay resulting should have been used in computing the overtime rate. In the scheme which the Appeals Court approved, the bonus was divided proportionately between regular rate and overtime rate.

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Texaco Rustproof protects against rust by forming a soft, self-healing, *waterproof* film on metal. If rust has already started, *Texaco Rustproof* gets right under it, arrests further rusting, and makes the existing rust easier to remove. In addition, *Texaco Rustproof* remains soft — and one application *will protect your equipment through the severest winter.*

Guard your valuable equipment against rust this easy, inexpensive way. Get *Texaco Rustproof Compound* or *Texaco Rustproof Compound (Spray)* from the nearest of the more than 2500 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

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Texaco Rustproof Compound can save maintenance costs not only on contractors' equipment, but on gas holders, waterworks, sewage disposal plants, bridges — wherever metal is exposed to weather, or most corrosive chemicals and fumes. Read the whole money-saving story in Texaco's 36-page book "Rust Prevention." Send for your copy today.

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INDUSTRY News

$10,000,000 Cement Plant for Palm Springs, Calif.

CONSTRUCTION of a $10,000,000 cement plant less than five miles from Palm Springs, Calif., by S. A. Guiberson Jr., Dallas oil millionaire, is contemplated, James I. Easley, district representative, County Board of Supervisors, has announced. War surplus material will be used for the manufacturing process, it was understood.

Owners of the Palm Springs resort, however, fear that holdings valued at more than $50,000,000 may be jeopardized by clouds of cement dust as the resort will be downwind from the new cement plant. Mr. Easley suggested that Palm Springs residents might seek protection under a new county zoning ordinance.

Feldspar Flotation Plant Opened

FELDSPAR FLOTATION CO. has started operations at its new plant at Spruce Pine, N. C., using the froth flotation separation method to produce feldspar, fine mica and practically iron-free quartz from a large pegmatite deposit a short distance from the plant.

Principals in the new company are H. A. Durham and C. C. Rogers, Sr., both of whom are associated with the Feldspar Milling Co.'s plant at Bowditch, N. C.; and W. F. Deneen, owner and operator of the Feldspar Production Co. of Erwin, Tenn.

Transfer Mica Operations

THE MICA COMPANY OF CANADA (New York) plant will transfer operations to Newport News, Va., William F. Vanderrest, manager, has announced. The company's operations at Asheville, N. C., also are scheduled to be moved to Newport News where a new plant has been built. According to Mr. Vanderrest, the moves are being made to bring the plants closer to seaport facilities, since most of the company's materials come from India and Madagascar.

Refractories Plant

GENERAL REFRACTORIES CO. plant at Los Angeles, Calif., one of 23 plants operated by the company throughout the United States, is manufacturing basic refractory brick using the standard Ritex process. Both unburned chrome-magnesite and magnesite-chrome bricks are being produced in standard and specialty sizes. Foreign chrome is imported and magnesium oxide is obtained from domestic plants which make it from dolomite and sea water. Magnesite is shipped in from Washington. The plant also produces silica bricks, fire clays, bonding mortars, and specialty products.

Expand Dredging Operations

DRAVO CORPORATION, Pittsburgh, Penn., contracted to build two lake barges and a hull for a new dredge for the Warner Co., has set up a temporary shipyard at the Van Sciver plant's land-locked lake, *Warner News* reports. The new "whirler," or clamshell bucket dredge, will be used to cut through the Bordentown Ferry Road into the Arsenal Tract, where the company's "Valiant" will move for dredging next year. The new barges will transport the aggregates from the "whirler" and the "Valiant" to the Van Sciver plant for processing.

Limit Charges on Gypsum Shipments

THE INTERSTATE COMMERCE COMMISSION has set a limitation on railroad charges for movements of gypsum products in truckline territory and between trunkline territory and New England territory, officials announced. The limitation came in ruling against carriers in a dispute with the United States Gypsum Co. over a series of shipments. According to the I.C.C., the carriers may impose rates which will not exceed 20 per cent of first class exception rates on plaster, and 22.5 per cent on gypsum wallboard.

Federal Aid for Sewage Control

PUBLIC LAW 845, formerly the Water Pollution Control Act, has been established authorizing the Federal Government to help individual states control pollution of watercourses, the Federal Security Agency has announced. The Act authorizes the making of loans to any State, municipality or interstate agency for preparation of plans and construction of necessary treatment works to prevent the discharge of untreated or inadequately treated sewage or other wastes into interstate waters.

Open $450,000 Limestone Processing Plant

LIMESTONE PRODUCTS, INC., has opened its $450,000 processing plant near Cleburne, Texas. Daily capacity is 300 tons, and the plant is said to be the only one of its kind in Texas producing the entire range of limestone products. These are being sold under the trade name, "Tex-Rox."

J. Lambert Lain is president of the corporation. Other officers and directors are: W. T. George, vice-president; W. E. Abbas, secretary-treasurer; and Dr. W. P. Ball, J. P. Swatzell, A. T. Lohman, John W. Carpenter, Walter Conley, Lynn Davis and Judge R. B. Hincks, directors.

Bid for Aggregate

CORPS OF ENGINEERS, Department of the Army, announces an invitation for bids to furnish 1,320,000 tons of concrete aggregate for McNary Dam. This includes an estimated 940,000 tons of coarse aggregate to be deposited into designated storage piles, and 38,000 tons of fine aggregate to be deposited into designated storage piles. Estimated percentages of the coarse aggregate to be furnished are as follows: No. 4 to ¾-in. size, 16 to 28 percent; ¾-in. to 1½-in. size, 18 to 30 per cent; 1½- to 3-in. size, 27 to 39 per cent; and 3-in. to 6-in. size, 15 to 27 per cent.

Form Vermiculite Company

TEXAS VERMICULITE CO. has been formed to process and distribute Zonolite-brand vermiculite products in Texas, according to an announcement by A. T. Kearney, president, Zonolite Co., Chicago, Ill. Gerald R. Stark will serve as president of the new company. The processing plant for production of the lightweight mineral insulation, and aggregates for plaster and concrete, will be located in Burnett, Texas, with temporary general offices at San Antonio.

Expands Rock Wool Production

PAUL LIME PLANT, Paul's Spur, Ariz., is being expanded to permit production of a new type of rock wool and larger quantities of dehydrated lime, Alfred Paul, Jr., owner, has announced. New equipment will boost production from 135 to 150 tons of lime per day.

Consolidated Installs Long Conveyor Belt

CONSOLIDATED ROCK PRODUCTS CO. has completed installation of a record length belt conveyor at its Irwindale, Calif., plant. The belt measures 2264 ft. from head pulley to tail pulley, travels for most of its length in a trench, passes under two railroad tracks and a county road through galvanized iron culvert pipe, moves 550 ft. per minute, and carries 1000 tons of sand and gravel per hour.

Troughing and return idler rolls and the head and tail pulley drive mechanism, equipped with roller bearings, were furnished by the Conveyor Co. of Los Angeles. The giant belt is a 36-in., six-ply type supplied by the B. F. Goodrich Co., Akron, Ohio. Five rolls of rubber were spliced together by vulcanizing to make the one endless belt 4717 ft. long.

Win Third Round of Blasting Case

NEW YORK TRAP ROCK CORP., New York, N. Y., recently won a third decision in action brought against the corporation by Mr. and Mrs. J. Freeman Dixon, who own and occupy premises in the neighborhood of the Corporation's Clinton Point quarry. The plaintiffs charged damage to their property and personal injuries from blasting operations at the quarry. The third hearing was before the Appellate Division of the Supreme Court for the Second Department which upheld findings of the Official Referee in two previous hearings that blasting at the quarry did not do damage or injury as alleged.

Produces Diatomite

EAGLE-PICHER CO. is mining diatomite in Nevada on the main line of the Southern Pacific Railroad to supply a processing plant, newly erected at Clark, T. C. Carter, vice-president in charge of insulation and diatomite products, has announced. The diatomite is said to be quite pure, and a large tonnage has been made available by stripping a very thin covering of overburden.

Talc Mill Operations

LOOMIS TALC CORPORATION, Gouverneur, N. Y., has closed its No. 1 mill at Emeryville, and reinstalled the machinery at No. 3 mill at Popple Hill. The move is designed to reduce operating costs, an announcement states. The Emeryville mill also is more vulnerable to fire.

Refractories Meeting

THE REFRACTORIES DIVISION, American Ceramic Society, will hold its Fall Meeting, September 9-10 at the Hotel Conneaut, Conneaut Lake Park, Penn., C. L. Norton, Jr., chairman, has announced. This will be a joint meeting with the A.S.T.M. Committee C-8 on Refractories, and the program, in general, will cover application of fuels to the manufacture of refractories.

Develop Gypsum Deposit

NORTHWEST GYPSUM CO. has developed a deposit of gypsum on the Snake River, near Weiser, Idaho, 60 to 140 ft. wide and a half mile long, according to William T. Smith, secretary and treasurer. There are two varieties of gypsum in the deposit: one carries 50 per cent sulphur trioxide and is suitable for fertilizer; the other is crystalline gypsum, suitable for commercial purposes. Two large quarries already have been opened with three more under way. Capacity is expected to reach some 1000 to 3000 tons per day.

Coming Conventions

September 20, 1948—
National Sand and Gravel Association, Directors' Meeting, The Broadmoor, Colorado Springs, Colo.

September 22, 1948—
National Ready Mixed Concrete Association, Directors' Meeting, The Broadmoor, Colorado Springs, Colo.

September 28-29, 1948—
National Lime Association, Meeting of Board of Directors and Executive Committee, The Cloister, Sea Island, Ga.

October 14-16, 1948—
American Institute of Mining & Metallurgical Engineers, Industrial Minerals Division, Regional Meeting, Sheraton-Coronado Hotel, St. Louis, Mo.

October 18-22, 1948—
National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill.

October 20, 1948—
American Institute of Mining and Metallurgical Engineers, Industrial Minerals Conference.

October 20-22, 1948—
National Industrial Sand Association, Semi-Annual Meeting, The Greenbrier, White Sulphur Springs, W. Va.

October 22-23, 1948—
American Concrete Pipe Association, Joint Meeting of Executive Committee, Technical Problems Committee, and Committee on Dues, Broadmoor Hotel, Colorado Springs, Colo.

November 4-6, 1948
Operating Division, National Lime Association, Meeting, Palmer House, Chicago, Ill.

Jan. 31-Feb. 3, 1949—
National Concrete Masonry Association, 29th Annual Convention and Concrete Industries Exposition, Cleveland Public Auditorium, Cleveland, Ohio.

February 7-9, 1949—
National Crushed Stone Association, 32nd Annual Convention, Hotel New Yorker, New York, N. Y. There will be no exhibit.

February 13-17, 1949—
American Institute of Mining and Metallurgical Engineers, Annual Meeting, San Francisco, Calif.

February 14-18, 1949—
National Ready Mixed Concrete Association, 19th Annual Convention, Hotel New Yorker, New York, N. Y. There will be no exhibit.

February 14-18, 1949—
National Sand and Gravel Association, 33rd Annual Convention, Hotel New Yorker, New York, N. Y. There will be no exhibit.

February 21-22, 1949—
Agricultural Limestone Institute, 4th Annual Convention, Edgewater Beach Hotel, Chicago, Ill.

Feb. 28-March 4, 1949—
American Society for Testing Materials, Spring Meeting and A.S.T.M. Committee Week, Edgewater Beach Hotel, Chicago, Ill.

LABOR RELATIONS

(Continued from page 63)

ship is the fact that through collective negotiation both the employer and his employes are free to bargain for terms, and both are equally able to grant or withhold the services or economic opportunities which they control. But, even so, where a collective bargaining agreement is concluded, it is not, in and of itself, a contract of employment. It does not impose an obligation on the employer to offer, or on the employes to accept, work. It merely prescribes the conditions upon which such work as is offered and accepted is to be done, and binds the parties to introduce its terms into the employment contract to which it applies [that is, in most cases a verbal contract with the individual when he is employed].

"Where, therefore, both the employment contract and the collective bargaining agreement are silent on the subject of hours of employment or fail explicitly to limit the length of the work day or work week beyond which no further work may be required, an employer has a right to demand overtime work from his employes and the further right, subject to the provisions of the grievance procedure, to discipline employes for refusing to work overtime without reasonable excuse. This has been the consistent holding of the courts, the National Labor Relations Board, and other arbitrators."

The part of this bargaining agreement covering "Hours and Overtime" was as follows: "A. The regularly scheduled work week shall begin and end at 6 a. m. on Sunday for all departments. B. For the purpose of computing overtime, 8 hours shall constitute a day's work. All time over 8 hours in any one day, and all time over 40 hours in any one work week shall be paid at the rate of time and one-half. During the season of boat operation, employes in the Boat End Department shall receive time and one-half their regular rate of pay for all time worked in excess of 8 hours in any 24-hour period." It was further provided that "overtime earned on a daily basis shall not be duplicated on a weekly basis." The employer, in this agreement, also promised to distribute overtime on as equitable a basis as possible—proof, as in many similar instances, that overtime was highly desired by employes.

Seasonal Industry

Presumably because the portland cement industry is more or less seasonal in character, the agreement specifically provides that the company establish "regular work weeks" which shall average "not less than 42 hours per week over periods of 4 weeks." This, of course, was a direct refutation of the claim of the four employes that 40 hours a week was the maximum contracted for, and is concrete evidence that the employes as a whole wanted a minimum of 8 hours overtime a month. The arbitrator could not do otherwise than rule that the four employes and the union were in the wrong, and the disciplinary action just.

Three other matters requiring decisions by the arbitrator involved the rights of management to direct its working forces. These rights were sought to be secured by an article in the agreement which reads as follows: "The management of the company and the direction of the working forces, including the right to plan, direct and control company operations, to hire, suspend, or discharge for cause, or transfer, to relieve employes from duty because of lack of work or for other legitimate reasons, and the right to introduce new or improved production methods or facilities, are vested exclusively in the company, subject to seniority rules, grievance procedure and other provisions of this agreement as herein set forth."

With the beginning of the busy season the company added a second shift in the machine shop and mechanics' department, to work from the end of the day shift, 4:30 p.m. until 1 a.m. Then, with the addition of new employes, the whole crew rotated between the two shifts, those on the second shift receiving a 5c per hr. premium, as provided in the contract. This arrangement was taken by management without consultation with the union. The union protested that the rotation of employes must be in strict accordance with the seniority rights of the workers; claiming specifically that in being required to rotate on shifts, the employes were "demoted" and that their "demotion" was without regard to seniority rules. In other words, the union contended that the older employes should have a right to choose the shift they preferred.

Since, the article in the agreement on seniority made no provision for preference in the matter of shift assignment, the arbitrator ruled that the company management was entirely within its rights. But, he added: "This ruling is without prejudice to the right of employes to seek redress under grievance procedure for individual grievances they may have, if any."

Another grievance is one that probably arises frequently where a company constantly strives to keep modern in manufacturing facilities. The company replaced a number of screw conveyors and elevators in the Raw Grinding Department with cement pumps (air conveyors), thus eliminating some jobs such as oiling the screw conveyors, etc. The employes affected were given the opportunity of being transferred to the Dryer Department at the same wage level and retaining the same seniority (which the contract read must be on a departmental basis), or of taking lower rated jobs in the Raw Grinding Department. They naturally made the transfer.

New Equipment Transfer

The union protested that the seniority rights both of these transferred employes and of those already in the Dryer Department were thus interfered with by unilateral action of the management. The arbitrator recognized the merit of this contention and ruled that the matter be made a subject for negotiation with the union. On the face of it, the management acted in the best interests of its employes, but evidently it did not reckon on the jealousies between working groups.

Another case in the same Raw Grinding Department involved the elimination of a previous job classification because of the installation of the new equipment, and the assignment of a new one to a certain employe, who got a 5c per hr. increase. The contract contained a common provision that job classifications were not to be changed during the life of the agreement—designed of course to prevent lowering classifications and hence indirectly reducing wages. The company management contended it was creating a new job and the only right of the union, through the proper grievance procedure, was to challenge the rate of pay established for it.

This kind of a problem, the arbitrator said, is often difficult of adjustment because of the resistance of employes to improved methods which may change their *status quo*. The arbitrator ruled that this was not creation of a new job and that the change in the status of this one, and a few other employes whose duties were changed because of the installation of the new machinery, merited new collective bargaining with the union on those clauses in the contract covering job classifications.

Buys Sand Company

E. M. BIRDSALL, who operates the Ed Birdsall Sand Co., Rapid City, S. D., has purchased the equipment and business of the Carlsen Sand Co. of that city, a company which has been producing washed sand at Wasta, S. D. The new owner contemplates installation of additional equipment and railway facilities on the property in order to increase production.

Resumes Talc Operations

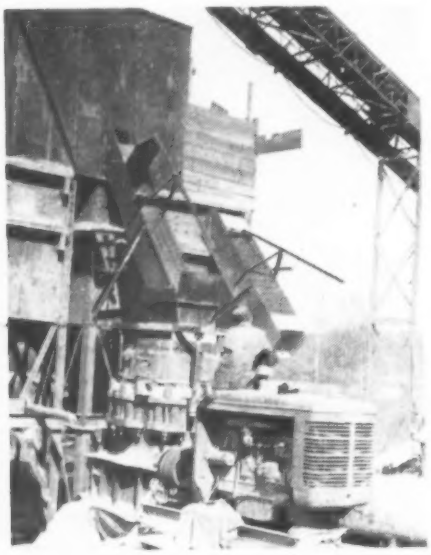
GOUVERNEUR TALC CO., Gouverneur, N. Y., has resumed talc mining and grinding operations after some ten months of construction work. The mine shaft has been sunk to a depth of more than 400 ft. and drifting has progressed about the same distance.

HINTS and HELPS

PROFIT-MAKING IDEAS DEVELOPED BY OPERATING MEN

Simple Crusher Set-Up

AT Winston-Salem, N. C., a crushed stone operation was recently started by W. E. Graham & Sons. Oversize



Efficient secondary crusher set-up. Note chutes covered with screen cloth to prevent stone bouncing out

stone in the bins can be chuted to a Symons cone crusher driven by an International Diesel through V-belt drives, and the crushed stone returned to the screening section by a return belt.

The installation makes an efficient, but simple set-up. A close examination of the illustration shows the type of chute gate used, and also how the chute is covered with some old worn out screen cloth so that any flying pieces of stone going to the cone can be kept from accumulation on the ground or possibly bouncing out and injuring an operator.

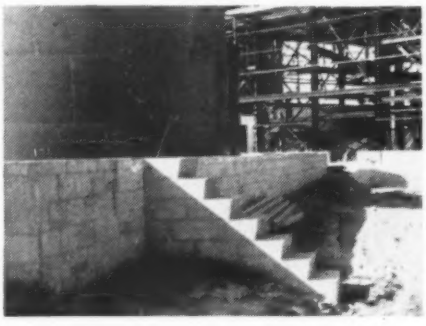
Stockpiling, Loading Agstone for Rail Delivery

AGRICULTURAL LIMESTONE, delivered by rail at Brownstone, Ill., is transferred from rail car to stockpile and from stockpile to spreader truck in a manner offering a simple and efficient answer to this problem. Material is unloaded from hopper-bottomed rail cars by means of a portable, self-contained belt conveyor, with a short integral feeder belt placed across the rails under the car. Stockpiles reach a height of 12- to 15-ft. The tail pulley of the ⅛-cu. yd. Sauerman Bros. scoop travels on a cable paralleling the railroad tracks, enabling the scoop to recover material from any one of several stockpiles. The scoop works against the toe of the pile at ground level, with the material caving down into the scoop.

An interesting feature of this and similar installations is that the spreader truck drivers operate the hoist when needed, doing away with a full-time operator at these comparatively small operations. It has been found that the drivers, after operating the scoop mechanism no more than three times, can handle it smoothly and efficiently. The driver-operator stands on a platform directly over the truck where he may see the scoop at all points in its travel. The Brownstone scoop is powered by a 15 hp. electric motor through a Munday hoist with a maximum pull of 65-ft.; while a larger operation at Shobonier, Ill., has a maximum pull of 240-ft. with a 1-cu. yd. scoop, powered by a 35 hp. electric motor.

Concrete Block Wall For Reagent Storage

FLOTATION REAGENTS used in the processing of phosphate, which can be caustic or like cresylic acid can do



Fire retaining wall for reagent storage

serious damage to the skin, are almost all inflammable. In view of this, a southern operation has a fire retaining wall of concrete masonry built around steel storage tanks containing the reagents. Being of concrete, the wall is said to be easily and reasonably built, and is more attractive than monolithic construction.

Simple Air Filter

ONE of the units making up a Cedarapids portable crushing plant in New England is driven by a Murphy

Oil drum and muslin serves as air filter for Diesel

Diesel, and as the plant operates dry, considerable dust was created. Therefore a simple air filter was made for the Diesel, as shown in the illustration.

It consists essentially of a flexible metal tubing that connects with the side of an old oil drum. The head of the drum has been cut out, and a piece of muslin is tied over the opening, giving an effective preliminary air filter to augment the one supplied with the original equipment.

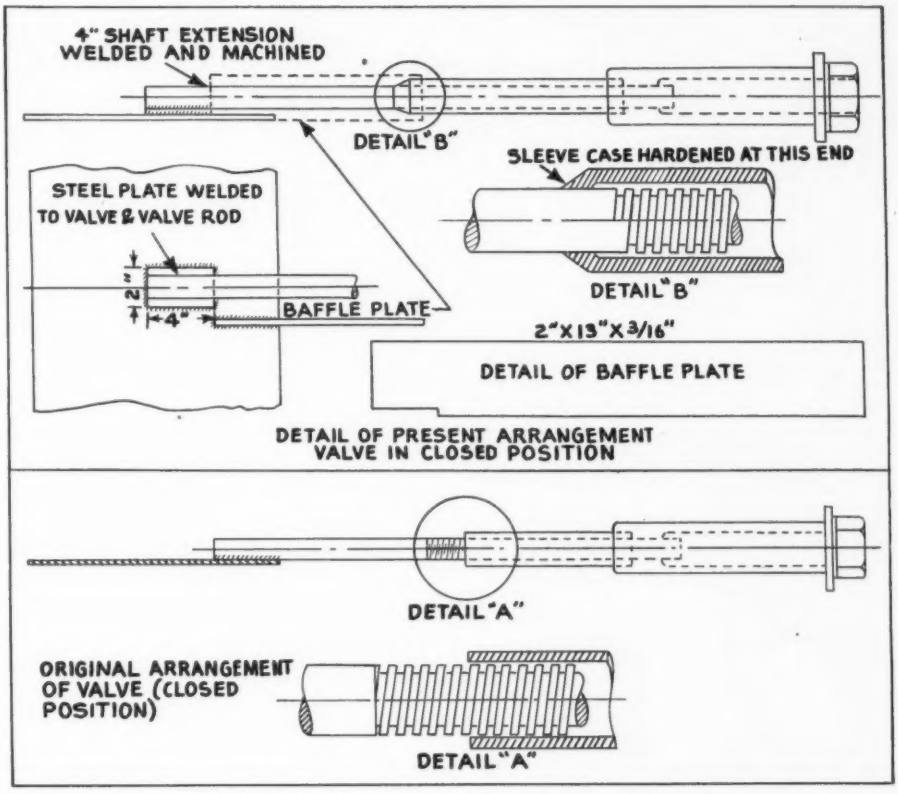
Agricultural limestone being stockpiled by portable belt conveyor from hopper bottomed rail cars, left, and spreader truck being loaded from same stockpiles, right, by a slack-line cableway bucket

Modified Valves for Air Separators

ON THE inside cover of the August, 1947, issue of ROCK PRODUCTS, there appeared a cut-away picture of a Sturtevant air separator with the original valve installation.

At the Lone Star Cement plant in Nazareth, there are two of these air separators with the modified valves, shown in the illustration. After giving at least five years of trouble-free service, the first two sets of modified valves are still in operation. With the original arrangement of the valve it was impossible to open it, once it was closed, without first crawling inside to clean out the hard-packed cement from around the threads of the valve shaft. This production-killing and time-wasting operation had to be done at least once a month or every time the mix was changed. The illustration shows detailed sketches of the old and the new valve assembly.

Several improvements have been made to this screw type valve, since the time it was furnished the Nazareth plant, according to the Sturtevant Mill Co.



Details of Present and Original Valve Installation

Concrete Curb Guides Truck Wheels

AT a new crushed stone operation in the New England States, the 22-ton capacity Easton quarry wagons haul rock from the quarry to the 30-in. Allis-Chalmers gyratory primary crusher. The quarry wagons can use one of two lanes, one on each side of the crusher.

Approaches into the building have heavy reinforced concrete abutments which are curved to serve literally to guide the trucks into proper position for dumping. To dump this type of haulage unit properly, the leg marked "A" in the illustration must rest on top of another concrete wall paralleling the driveway. When the lift dumping mechanism functions, the leg takes up the side thrust and keeps all wheels on the ground.

Protecting reinforced concrete abutment is curved to serve to guide truck wheels into proper position for dumping

"Breaking In" Drill Bits

IF DIAMOND DRILL BITS used in metal mines and quarries are "broken in" gradually before being placed in continuous use, drilling costs can be reduced by increasing the footage drilled by each bit and by speeding up the penetration rate with less diamond wear.

In a test on various commercial bits in granite, several factors affecting the performance of cast-set bits were investigated, including the type, grade, size, weight, and number of diamonds, the distribution of diamonds on the cutting surface and the contour of the surface, projection of stones through the surface, and the number and size of waterways in the bit.

In general, the results showed that bits set with the smallest diamonds gave the best average drilling results at the lowest cost per foot. The above information is taken from Report of Investigations 4233, released by the Bureau of Mines Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Penn.

Stone Deflector

PASSING of crushed stone from one unit to another, often not covered in plant descriptions, is accomplished in the following manner at the Neverson plant, owned by the Southern Aggregates, Inc., and leased to the Bryan Rock and Sand Co., Raleigh, N. C. Two Symons cone crushers act as the third set of reduction crushers. The oversize from the batteries of Tyrock screens passes to these crushers, the stone on the lower deck being diverted to the washing and final screening section. In the illustration the stone is going to the washing section, but by flipping the quadrant-shaped deflector downward this stone can go to the cone crushers for another reduction.

Showing stone going from primary screen to washing plant. By flipping quadrant downward, stone goes to cone crushers

new machinery

ROCK PRODUCTS

Chisel Type Rock Bit

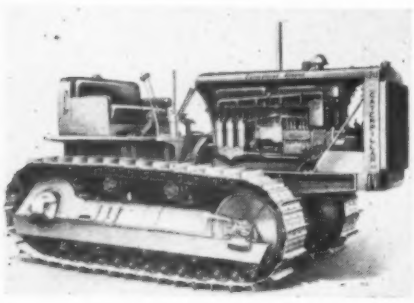
KENNAMETAL INC., Latrobe, Penn., announces the development of a new series of chisel type rock bits which can be screwed on any standard drill

This cemented carbide chisel type rock bit is now offered in six sizes

rods, requiring no conversion of existing equipment, according to the manufacturer. These bits are offered in six sizes from 1⅜- to 2¼-in., with threads inside the body of the bit which screw on steels that have F, H, or D threads, making a shouldered contact between bit body and drill rod. The manufacturer states that this cemented carbide bit is free of braze strains, and that faster drilling speeds and increased life of bits up to 100 times that of steel are obtainable.

Improve Tractor Design

CATERPILLAR TRACTOR CO., Peoria, Ill., has placed in production an improved Caterpillar Diesel D8 track-type tractor featuring 130 drawbar hp. and constant mesh transmission.

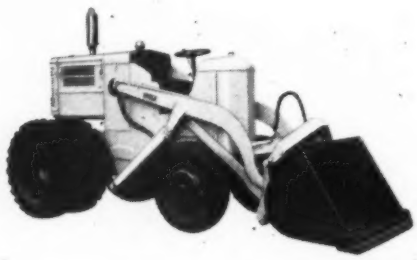


130 drawbar hp. feature of new model tractor

By attaining a 42 percent faster reverse speed, the manufacturer states that in bulldozing operations and others requiring frequent reversing, as much as 25 percent can be saved in operating cycle time. Third reverse speed is now 3.7 m.p.h. A full line of auxiliary equipment is obtainable for the new D8 built by Caterpillar, Athey, Hyster and Trackson.

Bucket Dump Control

FRANK G. HOUGH CO., Libertyville, Ill., announces the addition of its hydraulic bucket control to model HA, 10½-cu. ft. and model HL, 1 1¼-cu. ft., Payloaders, as standard equipment. This control both dumps and closes the bucket hydraulically. The device also allows for partial dumping enabling the operator to spot a load in two or more places. Advantages claimed for this feature also in-



End loader with hydraulic bucket dumping and closing attachment

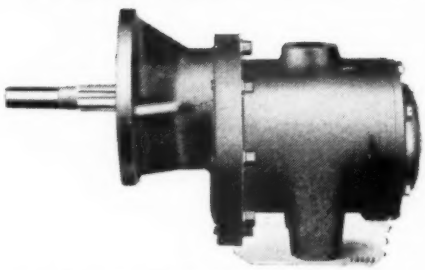
clude a saving in time, as the bucket does not have to be dropped to the ground to be closed.

Corrosion-Proof Pipe

UNITED STATES RUBBER CO., New York, N. Y., has developed a new corrosion-proof plastic pipe for use in mining and other industries. The pipe is constructed with the company's new Kralite, a blend of synthetic rubber and thermoplastic resins. It can be supplied in rigid and semi-rigid forms and in sizes ranging from ¼- to 2-in. o.d. The pipe is reported to be not only resistant to internal corrosion, but also external corrosive forces.

Compact Air Starters

INGERSOLL-RAND CO., Phillipsburg, N. J., is now producing air motors for use as starters on internal combustion motors. Known as the 9BM and the 20BM, these motors have 9 and 20 hp., respectively, at 90 p.s.i. air pressure. These air motors are of the "Multi-Vane" type and the throttle valve is of the quick opening type, giving peak horsepower almost immediately. A

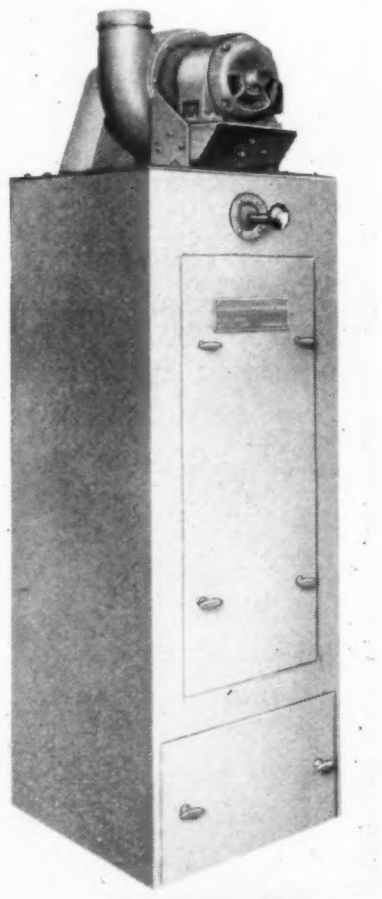


New air motor for starter of internal combustion engines develops 90 p.s.i. air pressure

single step spur gearing is used to obtain suitable speeds.

Small Size Dust Collector

PARSONS ENGINEERING CORP., Cleveland, Ohio, is now marketing a line of small, portable, self-contained dust collectors, with air capacities ranging from 550- to 1350-c.f.m. Marketed under the trade name Gem, these new units are applicable for filtering and collecting industrial dusts.



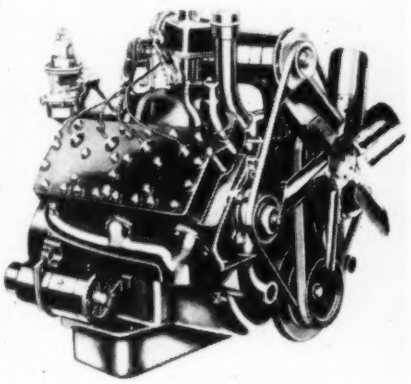
Self-contained, portable dust collector for air streams from 550- to 1350-c.f.m.

Industrial Engines

THE FORD MOTOR CO., Detroit, Mich., is in production with five new power plants for the industrial engine field, according to J. R. Davis, vice-president and director of sales and advertising.

These engines are said to be particularly adapted for the operation of cranes, shovels, pumps, winches, hoists, and concrete mixers. The industrial engine models are the 337 and 239 V-8's; the 254 and 226 6-cyl. and the 120 4-cyl., the numerical designation indicating cubic inches of piston displacement in all cases.

The 337 V-8 bore and stroke is 3½ x 4⅜-in.; compression ratio is 6.5 to 1; and it develops 258 ft. lb. torque. The 254 6-cyl. engine bore and stroke is 3½ x 4.4-in.; compression ratio is 6.7 to 1; and it develops 211 ft. lb. torque. The 239 V-8 engine has bore and stroke of 3 3/16 x 3¾-in.;



Model 337 V-8 industrial engine

compression ratio is 6.8 to 1; and it develops 187 ft. lb. torque. The bore and stroke of the 226 6-cyl. engine is 3.3 x 4.4-in.; compression ratio is 6.7 to 1; and maximum torque is 183 ft. lb. The 120 4-cyl. engine has a 6.5 to 1 compression ratio and 3 3/16 x 3¾-in. bore and stroke. Three, four and five-speed heavy-duty transmissions are available for these engines.

Packaged Power Take-off

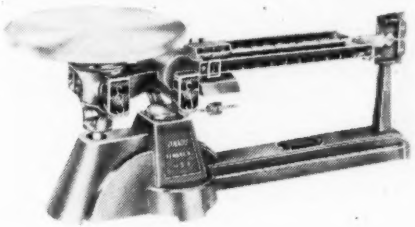
TRUCK EQUIPMENT DIVISION, Davey Compressor Co., Kent, Ohio, has developed a new power take-off, the P-80, that is 25 lb. lighter and contains 12 less parts than its predecessor. The take-off unit is identical for all trucks and mounting parts for individual truck makes are maintained in stock at all times.

Record Smoke Density

BAILEY METER CO., Cleveland, Ohio has developed an electronically-operated smoke density recorder which is said to accurately measure and record the density of smoke or dust in flues or ducts. This recorder serves to warm furnace operators of faulty combustion conditions. This instrument comprises a standard electronic recorder, a Bolometer type smoke detector and a sealed beam light source. The Bolometer type smoke detector and the sealed beam light source are used as the primary element.

Reinforced Balance

OHAUS SCALE CORP., Newark, N. J., is announcing a triple beam balance featuring a stainless steel plat-

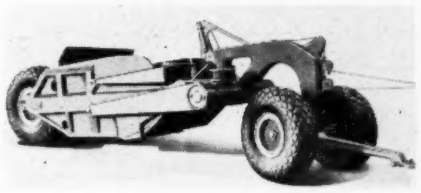


Balance with stainless steel plate and beams for durability

form and beams for all-element resistance. The balance has self-aligning bearings of high-grade polished agate to insure minimum friction and full contact along the knife edges at all times. A sliding-type poise is said to insure stability.

New Earthmovers

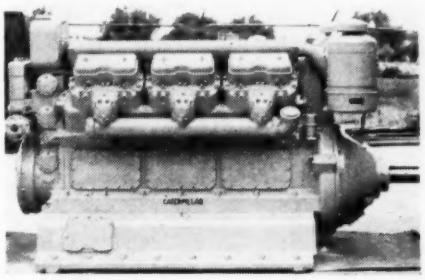
CATERPILLAR TRACTOR CO., Peoria, Ill., has announced 10 additions to be made to the company's line of equipment, featuring a new two-wheel Diesel tractor-scraper unit; a new four-wheel Diesel tractor-wagon unit; two additional scrapers; four new Diesel engines to be made available as industrial power units, electric sets and complete marine engines; and a fifth new Diesel engine integral



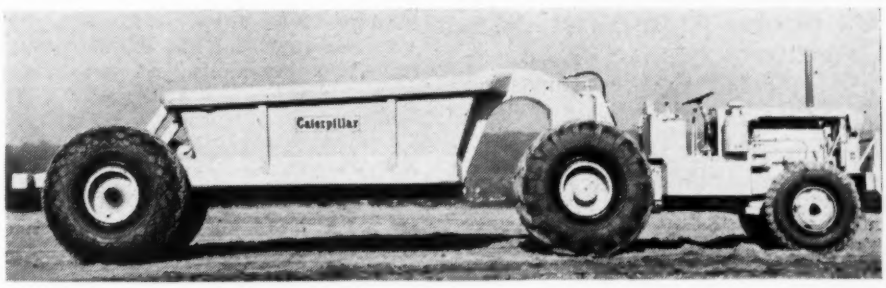
No. 90 cable controlled scraper with struck capacity of 21.2 cu. yds. and heaped capacity of 27 cu. yds.

with the wheel-type tractors.

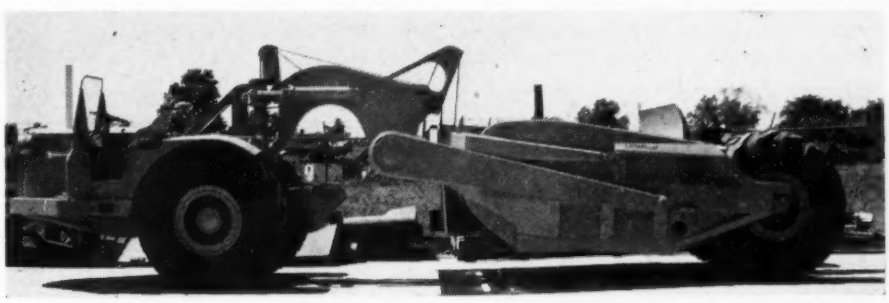
Included are the "Caterpillar" Diesel DW21 two-wheel tractor and its design-matched trailed unit, the No. 21 scraper; Diesel DW20 four-wheel tractor, equipped with W20 wagon; No. 40 hydraulic controlled Scraper designed for use with the Diesel D4 track-type tractor; No. 90 Scraper designed for use with the recently improved Diesel D8 track-type Tractor; Diesel D397 engine, a 500 hp. V12 engine with blower; Diesel D386 engine, a 400 hp. V12 engine; Diesel D375 engine, a 333 hp. V8 engine with blower; and Diesel D364 engine, a 267 hp. V8 engine.



Diesel D397 V12 engine with blower, having maximum output of 500 hp. at 1200 r.p.m. governed full load speed



Diesel DW20 wheel-type tractor, equipped with W20 wagon. Bottom dump wagon has struck capacity of 14 cu. yds. and heaped capacity of 22 cu. yds.



Diesel DW21 wheel-type Tractor, equipped with No. 21 Scraper. DW21 has five forward speeds, ranging from 2.6 to 20.6 m.p.h. and can make a non-stop turn in 35 ft. while the unit has a turning radius of 28 ft. The Scraper has a struck capacity of 14.5 cu. yds., heaped capacity of 18½ cu. yds., and a 9 ft., 6-in. cut

Wedge Wire Screens

CAMBRIDGE WIRE CLOTH CO., Cambridge, Md., is manufacturing wedge wire screens for washing, dewatering, classifying, and similar purposes. The

Wedge wire screen gives freedom from clogging

product, to be sold under the name Cambri-Wedge, is unique in that the wedge shaped wires are formed into loops at regular intervals. The desired number of wedge wires are fastened together with cross rods which are then riveted or welded at the ends to produce a rigid screen. Freedom from clogging is claimed. Since the smallest opening between wires is at the top of adjacent wires, any particle of material small enough to drop through the opening must necessarily fall all the way through instead of lodging between the walls. Screens can be fabricated in a variety of lengths, widths, and metals, with two types of surfaces available.

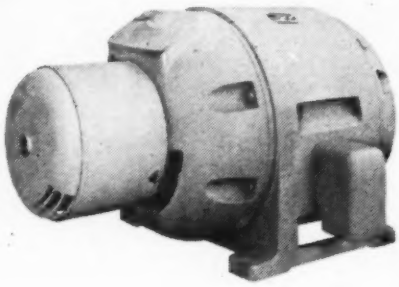
Oil Burner Atomizers

COEN COMPANY, San Francisco and New York, recently added to its lines of multiple tip oil burner atomizers. The new line is exclusively for rotary kiln burners. The nozzle head of the atomizer is fitted with a cluster of three to five spray nozzles. This type is recommended in place of the conventional single spray nozzle for installations firing at greater than 3 to 5 g.p.m.

Specific features claimed are: (1) fineness of atomization produced by small spray nozzles obtainable for large firing rates; (2) greater "turndown" obtainable for any given supply pressure, since small spray nozzles atomize better at lower pressures than large nozzles; (3) excellent atomization even at exceptionally narrow spray angles; (4) freedom from dripping and more uniform spray distribution because of better atomization of smaller spray nozzles; (5) flame patterns readily engineered for any type of pulp or other substance to be dried or burned. Other advantages claimed are: maximum kiln output; optimum heat distribution in firing zone insuring maximum brick life; complete combustion without excess air; and a clean product. For combination gas or oil firing, recently developed features allow operation on either fuel without removal of oil burner atomizer.

Synchronous Motors

GENERAL ELECTRIC CO., Schenectady, N. Y., has announced a new line of general purpose, Tri-Clad, high speed synchronous motors and genera-

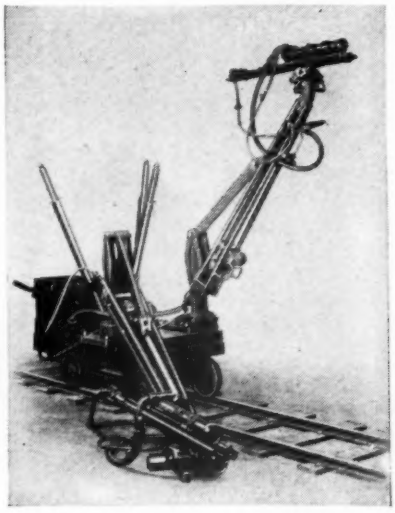


Sleeve-bearing synchronous A-C generator with direct-connected exciter

tors in "900 series" frame sizes. The new motors are available in standard ratings from 20-hp. to 1000-hp., 60 cycle, at speeds of 514 to 1800 r.p.m. in either two-phase or three-phase types. Generators are available in ratings from 12½ to 1250 KVA.

Air-Powered Drill Jumbo

INGERSOLL-RAND CO., Phillipsburg, N. J., has announced a drill jumbo which features an air-powered boom which can be raised or lowered at the touch of a lever. It was designed for high-speed driving of drifts, crosscuts, and tunnels, and is capable of working in an opening with a height up to 9 ft. and with a width varying between 5 and 14 ft. All controls are



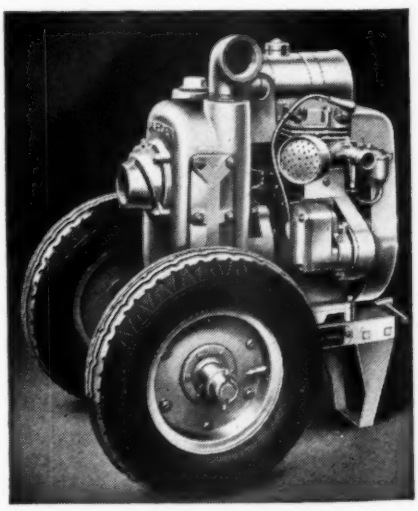
Booms on jumbo are raised and lowered by air motors

located on the front end of the booms where they are convenient to the operator. The booms are locked into position and cannot creep or settle during the drilling operation.

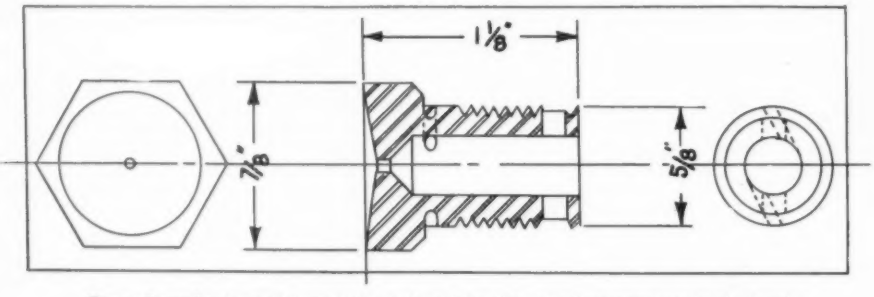
Three screw-driven adjustable-length ceiling jacks mounted on the car of the jumbo serve to hold it in place when drilling is being done. These jacks fold back onto supports when the jumbo is to be moved. The booms are also swung back and lowered onto their supports on the car. Drills used on the boom jumbo are equipped with long feeds for the handling of long drill steel.

High Pressure Pump

JAEGER MACHINE CO. is now in production on its 2-in. portable pressure pump, Model 2PAFH. At 10-ft. suction lift, this pump has a range of volumes and pressures from 135 g.p.m. at 10 lb. discharge pressure to 30 g.p.m. at 60 lb. discharge pressure, and a maximum shutoff pressure of 70 lb. The pump is useful for water supply, washing down trucks and equipment, and for fire protection.



Portable pressure pump



Type of mechanical oil burner tip designed for three to five openings in the head

A.R.B.A. MEETINGS and EXHIBITS

Set New Records for Attendance

Airplane view of largest display of earth-moving and auxiliary equipment in the world at Soldier Field, Chicago. The Road Show was held in connection with the A.R.B.A. convention.

MEETING at the Stevens hotel, Chicago, Ill., July 16 to 24, the American Road Builders Association held its 45th annual convention. In conjunction with this meet, the first Road Show to be held in eight years was opened to association members and the public in nearby Soldier Field. Attendance at this convention was the largest in association history, and included over 900 foreign visitors from 56 countries. The tremendous strides taken in the last few years in portability, capacity and adaptibility of earthmoving equipment were stressed in the technical sessions of the convention as well as in the 30 acre exhibition site.

The convention was officially opened with an address by J. T. CALLAWAY, president, and a welcome extended by the Mayor, Martin J. Kennelly of Chicago, and Dwight H. Green, Governor of Illinois. The first weekend was given over to business meetings of various committees of the association. Technical meetings of the association at the hotel covered all phases of earthmoving, contracting, road building, labor relations, financing and management.

MAJOR GEN. PHILIP B. FLEMING, Administrator, Federal Works Agency, in an address to the convention, sounded the keynote for the times when he said: "The time has come when we must not only build more and better highways, but we must build them faster than ever before." He mentioned the fact that increased prices had seriously cut the number of miles of highway that could be constructed now over 1940 for the same amount of money; but he went on to say that there are indications that construction costs have apparently reached their peak and are beginning to level off. "In the second place," he continued, "some roadbuilding materials and items of equipment that have been in short supply since the war are now becoming more plentiful." In speaking of the Federal-Aid Highway Act of 1948, he stated that it assured continuation of the Federal highway program on only a slightly reduced scale through the fiscal years 1950 and 1951. The measure authorizes a Federal appropriation of $450,000,000 in each of the two years following July 1, 1949; and of course these funds will have to be matched by the States.

Two sessions of the convention were of particular interest to the rock product producer: "Earthmoving with shovels, cranes, draglines, wagons and loaders," and "Earthmoving with scrapers, bulldozers and graders." These meetings are reported in full elsewhere in this issue. There were no general meetings held at the hotel other than the annual banquet; it being felt that as much time as possible should be given to the machinery exhibits at Soldier Field.

One of the largest exhibits was that of the Caterpillar Co., and auxiliary equipment supplied by Athey, Trackson and Hyster

Postwar Developments In Earthmoving Machinery

Two morning sessions at the American Road Builders Association convention were devoted to new developments in earthmoving machinery, as well as a general review of when and where to use what equipment in order to do a given job most economically. Shovels, cranes, draglines, wagons and loaders were discussed the first day, with scrapers, bulldozers and graders being reviewed on the second day.

Greatest part of the first meeting

was devoted to presentation of a slide film titled "The Changing World," which described functional design, job applications and job analysis of power cranes and shovels. Stressed in the slides was use of the proper type and capacity machine for a given job, taking into account boom equipment, suitable mounting, required output capacity and type of material to be moved.

After an introduction to the general subject, each of the four types of units were taken up in detail, discussing radius of swing, depth of cut or height of bank to be excavated, distance to haulage units or spoils bank and maximum load to be lifted. Following presentation of the slide film, questions were solicited from the floor. A color film of Euclid Road Machinery Co., Cleveland, Ohio, equipment in action was also shown and discussed.

On the second day four motion pictures were presented by equipment manufacturers showing typical machines in actual job applications. These pictures covered working conditions from those in the Messabi Iron range in winter to summer work in a California desert. Each picture was followed by a floor discussion concerning the type of equipment just shown. The first picture showed types of graders. The second covered crawler mounted dozers, with and without wagons and scrapers; and rubber mounted wagons and tractors. Both pictures were shown by the Caterpillar Tractor Co. In the third picture, presented by R. G. LeTourneau, many members saw the new rubber-tired dozers in action for the first time. These units, possibly marking the greatest departure from any pre-war earthmoving machine, are built by the exhibitor of the picture and La Plant-Choate Manufacturing Co., Inc. These dozers are capable of speeds up to 15 m.p.h. both forward and reverse and are particularily adapted for cleanup work around shovels where speed counts, or for spot jobs with intervening travel over highways. Fourth picture, illustrating rubber-tired scrapers and tractors, was shown by LaPlant-Choate Manufacturing Co., Inc.

Hydraulic-controlled angle dozer of Bros Boiler & Manufacturing Co., on Caterpillar D-6

Equipment Manufacturers Exhibit

WITH AN ATTENDANCE FIGURE of nearly 200,000 visitors, the 1948 Road Show held July 16 to 24 at Soldier Field, Chicago, was the focal point for national and international attention. Registration of over 900 foreign visitors at the exhibition spoke well for the place American earthmoving and road building machinery holds in the eyes of the world. The Road Show was held in conjunction with the 45th annual convention of the American Road Builders Association.

Chief reason for the importance attached to this exhibition was the fact that here was the first opportunity for inspection and comparison of heavy machinery, much of it wholly new, since before the war (the last Road Show was held eight years ago). This fact, coupled with the shortage of replacements for existing machinery over the past six years, served to highlight the new machines or new features for other equipment; much of which was being actually demonstrated in the 30 acre site.

Pictures and booth descriptions that follow are not meant to be comprehensive, but merely supplement and add to those descriptions carried in the June and July issues of ROCK PRODUCTS. Many manufacturers were showing new equipment for the first time at this show, and therefore did not disclose the machinery prior to the opening of the exhibition.

Hydraulically-controlled American Tractor Equipment Corp., 5.6-cu. yd. scraper mounted on International ID-9 tractor

AMERICAN CHAIN & CABLE CO., INC., Bridgeport, Conn. A new Acco-Loc splice, a system for weaving the strands of the end of the cable around the running cable in order to form a splice that is completed with two patented clamps, was displayed.

AMERICAN TRACTOR EQUIPMENT CORP., Oakland, Calif. A 5.6-cu. yd. heaped rubber-tired scraper was exhibited by this manufacturer in conjunction with the International Harvester show, for which equipment the scraper is specifically built. Bulldozer attachments for the same tractors also are produced. Scrapers are also built with 6.9-cu. yd. heaped capacity.

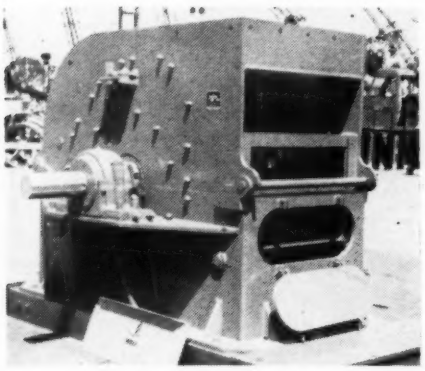
BRODERICK & BASCOM ROPE CO., St. Louis, Mo. Two working scale models of wire rope fabricating machines attracted attention to this booth: a planetary strander, laying up a 19 wire strand, and a closer, taking strands from the first machine and forming finished rope.

BROS BOILER & MANUFACTURING CO., Minneapolis, Minn. A line of hydraulically controlled straight and angle dozers for use with two Caterpillar Tractor Co. models, the D-4 and D-6, in addition to the regular line of boilers and equipment, was displayed. The booth contained the D-6 model attached to a tractor.

CARVER PUMP CO., Muscatine, Iowa. A large open water tank was installed in front of this exhibit with a pump mounted above it continually pumping a stream of water that fell back into the tank as a means of attracting attention. The booth contained pumps from 1- to 10-in. discharge capacity, powered by Wisconsin air-cooled engines in the smaller sizes and Le Roi, Chrysler and Continental engines in the larger models. The company also produces pumps powered by Diesel engines and belt-driven models.

CATERPILLAR TRACTOR CO., Peoria, Ill. Covering a large area with a central tent housing sales, engineering and press departments, this exhibit also included equipment produced by other manufacturers for Caterpillar tractors: Athey, Trackson and Hyster. Introduced for the first time were ten new machines or models, including: two and four wheeled scrapers and matched tractors; and five wholly new Diesel engines designed for stationary power units, including both V8 and V12 designs. Scrapers and wagons on display ranged in capacity from 4½- to 27-cu. yd. heaped. Some of these machines are totally new and their production depends on completion of a new plant now being built at Peoria. Trackson Co., Milwaukee, Wisc., displayed four Traxcavators

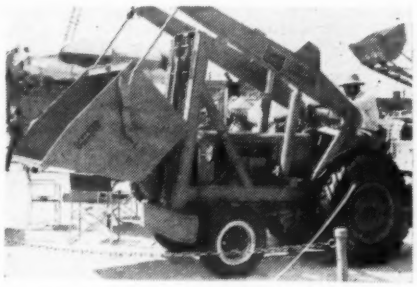
Corner of the Carver Pump Co. exhibit showing B. J. Carver, seated to the left



New over-running hammermill of Eagle Crusher Co., Inc.

(bucket loaders) ranging in capacities from ¾- to 2-cu. yd.

DAVY COMPRESSOR CO., Truck Equipment Division, Trent, Ohio. Stressed in this exhibit was the company's new Model P-80, heavy duty, split propeller power take-off. According to the manufacturer, this power take-off delivers full engine horsepower through a V-belt drive. The device replaces a segment of the drive shaft without lessening the efficiency of the vehicle. A Dodge Power-Wagon, fitted with a power take-off and a Davey Model 105 air compressor were exhibited at the show.



A Type DID Dempster-Dumpster materials handling bucket attached to a Minneapolis-Moline wheel type tractor

DAYBROOK HYDRAULIC CORP., Bowling Green, Ohio. Of chief interest to the rock products producer was a semi-trailer dump body of 17½-cu. yd. capacity, fitted with a triple tandem hoist, consisting of three hydraulic cylinders for raising or lowering the dump body. This hoist system is reported by the manufacturer to lower working pressures and reduce body stress. A second body exhibited was the new Hi-N-Lo air entrained concrete delivery body of the non-agitating type. This body of 3-cu. yd. capacity has a discharge range from ½- to 7½-ft., by means of a patented hydraulic lift that is applied to the body.

Portable crushing, screening plant of Diamond Iron works, Inc., has a capacity of 110-cu. yd. per hr.

DEMPSTER BROTHERS, INC., Knoxville, Tenn. Type DID Dempster-Dumpster detachable material handling body was exhibited in conjunction with the display of Minneapolis-Moline industrial tractors. The hydraulic lift unit for the tilt-type body was mounted on a model RTI 27 hp. wheel-type tractor.

DIAMOND IRON WORKS, INC., Minneapolis, Minn. Displayed at this booth was a portable crushing and screening plant, Model 66. This model, which has a capacity of 110-cu. yd. per hr., based on 25 per cent of the material requiring crushing and the feed being of average characteristics, incorporates a 10- x 36-in. jaw crusher; a 30- x 18-in. roll crusher; a 4- x 10-ft. 2½-deck vibrating screen and a 20- x 48-in. 2-deck vibrating screen.

EAGLE CRUSHER CO., INC., Galion, Ohio. Emphasis was placed on the new overrunning hammermill 36- x 42-in., capable of 75 to 100 t.p.h. production. This mill can be fitted with either single or multiple hammers. The manufacturer states that cage bars and breaker plate adjustments may be made while the machine is in operation. Also exhibited was a 20 x 36-in. steel plate welded construction jaw crusher and a Model 400 bucket loader mounted on an International K-5 truck.

ELECTRIC STEEL FOUNDRY CO., Portland, Ore. A new box type renewable alloy steel bucket point was on display which the manufacturer claims can be attached or removed faster than any other renewable point. These points, formed from special Esco analysis steel, are made for all sizes shovel or dragline bucket. Also shown was a 13-cu. yd. dragline bucket, a 3½-cu. yd. cast-weld bucket, a ½-cu. yd. perforated dragline bucket, and specialties such as the Esco hinge-type chain repair link.

FAIRBANKS-MORSE & CO., Chicago, Ill. An illuminated backdrop set off the display of cut-away models of typical magneto-ignition systems this company manufactures for all types of earthmoving machinery. Much of the large equipment at the show incorporated these systems, including Allis-Chalmers, Wisconsin and Continental motors.

FOUR WHEEL DRIVE AUTO CO., Clintonville, Wisc. Of greatest interest to quarry operators in this display was the new Model ZU, a heavy-duty on or off highway tractor type truck rated at 33,000 lbs. gross vehicle weight. Also exhibited were other models such as the M-7, a 7 to 10 ton truck powered with a 186 hp. Buda engine.

Non-agitating concrete carrier of 3-cu. yd. capacity displayed by Daybrook Hydraulic Corp.

GALION IRON WORKS & MANUFACTURING CO., Galion, Ohio. New Model 116 motor grader was highlighted at this display, a grader powered by a 100 hp. Diesel engine and weighing, with extras, 30,000 lbs. The balance of the display consisted of eight rollers ranging in weight from 3 to 10 ton, and five motor graders covering weights from 8,900 to 23,000 lbs.

GENERAL EXCAVATOR CO., Marion, Ohio. Due to the large demand for equipment, this manufacturer exhibited no actual machines. Three working models of air-cushioned clutches such as are used in both General excavators and the Osgood equipment attracted much attention to this booth. The Osgood Company uses three of these clutches on 1¼-, 1½- and 1¾-

A 13-cu. yd. dragline bucket and chain in exhibit of Electric Steel Foundry Co.

New Hanson ½-cu. yd. shovel powered by 60-hp. Buda engine

cu. yd. shovels; and four clutches on the 2- and 2½-cu. yd. machines. General Excavator Co. uses three air clutches on the ¾-cu. yd. shovel.

GEORGE HAISS MANUFACTURING CO., INC., New York, N. Y. Attention in this display was focussed on the new Model 80-W heavy duty bucket loader with a capacity of 5- to 8-cu. yd. per min. Elevator buckets discharge to a swing conveyor that can be spotted in a radius of 280 deg. All controls, including raising and lowering of the boom, are activated by hydraulic cylinders. Also on view was a railroad car unloader in actual operation. These units are powered by Waukesha gasoline engines.

HANSON CLUTCH & MACHINERY CO., Tiffin, Ohio. Three machines were shown: Model 41, a ½-cu. yd. shovel, powered by a Buda 60-hp. gasoline engine, featuring a low center of gravity and a new air-controlled steering mechanism; a ⅜-cu. yd. trench hoe; and a rubber-mounted yard and dock crane rated at 2 ton lift, 4-ton carry.

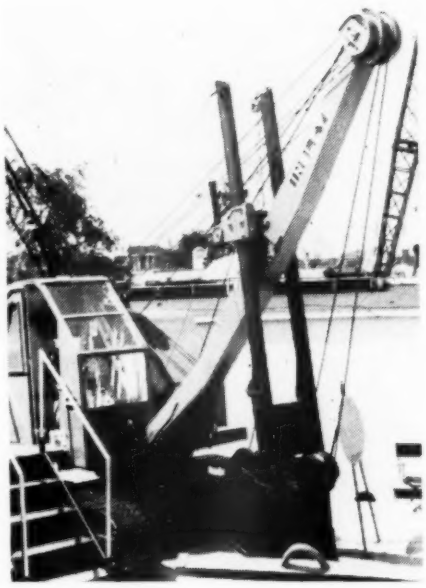
HENDRIX MANUFACTURING CO., Mansfield, La. Three perforated, general purpose dragline buckets of ½-, 1-, and 2-cu. yd. capacity were displayed at this exhibit. Complete literature describing the company's line of buckets from ⅜- to 40-cu. ft. was available at the booth. These buckets are claimed by the manufacturer to be up to 40 per cent lighter than other buckets of similar capacity; and to be of all-welded construction with 12 per cent manganese chains.

INGERSOLL-RAND CO., New York, N. Y. Striking feature of this exhibit was an actual demonstration of several of the manufacturer's new rock drills, including the Quarrymaster, a completely self-contained crawler-mounted, rock drilling unit including an air drill, compressor, propulsion equipment and auxiliaries. The drill is operated by air, with a positive power feed, controlled drill rotation and continuous hole cleaning accomplished by forced air. Seven sizes of portable compressor were also exhibited, ranging in capacity from 60- to 500-c.f.m. Another new tool featured at this show was the electric impact wrench, plus modifications of air activated tools.

Demonstrating the Ingersoll-Rand Quarry-master drill

INSLEY MANUFACTURING CORP., Indianapolis, Ind. In this manufacturer's exhibit was a ½-cu. yd. shovel, the new model K-12, available with either Buda or General Motors Diesel or gasoline power unit. Latest modification of this line is in the introduction of the Hill-Billy, model HB-12, featuring a leveling cradle mounting between the crawler and digging unit of the machine which allows for adjustments up to 32.5 percent grade, and which will allow efficient operation up to 60 percent, according to the manufacturer. Also on view were the four mountings available for these machines: shovel, hoe, dragline and clamshell.

MACK TRUCKS, INC., New York, N. Y. Exhibited here was one of the largest trucks in the show, the new model LV, a 22½-ton payload capacity end-dump truck weighing 38,000 lb. empty. This truck is powered by a 275-hp. supercharged Diesel engine. Also shown were integral parts of the



Model K-12 Insley ½-cu. yd. shovel

unit, including a two-range, eight-speed transmission, claimed to be the largest in any truck. Also shown was a medium sized dump truck, rated at 25,000 lb. gross weight.

MARMON-HERRINGTON CO., Indianapolis, Ind. This exhibit included a new conversion unit that makes the Ford Motor Co. model F-7 truck an all-wheel drive machine, known as the Q series. The unit is powered by a 145-hp. heavy-duty truck engine, and is available in either four or six-wheel drives with a gross vehicle weight ranging from 21,500- to 35,000 lb. and a wheelbase of from 136.5- to 220-in. This vehicle is designed for on or off highway use. Two additional models: the MH-440 series and the MHR6-4, with 131 and 100 hp. engines, respectively, were shown. Marmon-Herring-

A 2-cu. yd. loader in the Frank G. Hough Co. exhibit has hydraulic controls for elevating, lowering bucket; also for dumping and returning bucket. It is mounted on International TD-14 Diesel tractor

A 16½ cu. yd. M-R-S Manufacturing Co. Mississippi wagon drawn by an International No. 3 tractor

ton trucks are available with Hercules gasoline or Diesel power units.

M-R-S Manufacturing Co., Flora, Miss. Largest unit in this display was a 16½ cu. yd. struck measure Mississippi Wagon, a four-wheel, rubber-tired, bottom-dump wagon with hydraulic cylinder attachment that permits transfer of trailer weight to tractor when greater weight is needed on tractor drive wheels for traction. A four wheel rubber-tired tractor, known as the International Diesel Modification No. 3, is marketed by M-R-S Co. for use with the wagon. (International Harvester wheel-type tractor.) On exhibit also were other tractors fitted with attachments such as bulldozers and Bucyrus-Erie 2- and 4-wheel scrapers.

Murphy Diesel Co., Milwaukee, Wis. Exhibited was the new model ME-46, a 66KW generator set powered by a 4-cylinder, 100 hp. Diesel engine. Also displayed was model ME-66, a 6-cylinder, 150 hp. stationary Diesel engine that develops up to 180 hp. for intermittent demand.

N. P. Nelson Iron Works, Inc., Clifton, N. J. Centered in this booth was a model P-10 rubber-mounted, heavy-duty bucket loader with a capacity of 3 to 4-cu. yd. per min., and a maximum discharge height of 10-ft. The same machine is also available with a crawler mounting. Features of this machine include hydraulic control for boom movement; Timken bearings on head and feeder shafts; twin-disc clutches with automatic overload release on elevator clutch and renewable spiral facings. It is powered by a LeRoi gasoline engine which develops 40 brake hp. at 1550 r.p.m.

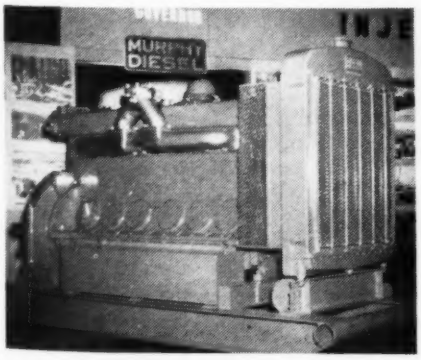
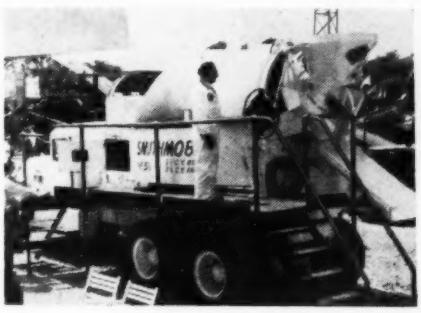


Exhibit of Murphy Diesel Co., included model ME-46, 66-kw. generator set powered by a 100-hp., 4-cyl. diesel

Nordberg Manufacturing Co., Milwaukee, Wis. Cut-away scale models of both a standard and short head cone crusher, and a vibrating screen were on display together with a continuous slide movie showing all latest additions to the company's line of heavy equipment. Slide views included a 9.5- x 11-ft. rod mill, a Symons 22-in. intermediate cone crusher offered as a "packaged unit," a Symons Rod-Deck vibrating screen and Diesel engines rated up to 8,650 hp.

Ransome Machinery Co., Dunellen, N. J. Of interest to producers in this display was the 4½-cu. yd. transit mixer (6-cu. yd. agitator), mounted on an FWD 2½ ton truck. This particular model had been raised 8-in. on the chassis by inserting a wooden riser under the mixer, thus allowing a sufficiently high discharge so that a ramp



A 5½-cu. yd. transit mixer of the T. L. Smith Co., mounted on a 6-wheel Autocar chassis

was unnecessary for a specific eastern job. These mixers feature two speeds, both forward and reverse; lightweight drum, blades and doors of an abrasive resisting steel; chilled car wheel drum rollers; a calibrated water tank; leakproof doors and a two piece distributing chute.

John A. Roebling's Sons Co., Trenton, N. J. A working, scale model of the company's new Sky Hook was on display across the back of the booth. This machine, in production two years, is a self-powered carriage supported on an overhead cable, and that carries two electric motors: one providing traction power, the other powering the winch for raising or lowering the load. Carriage and machinery for the Sky Hook is manufactured by Pointer-Willamette Co., Portland, Ore. Also shown at this booth was special cable for post-stressing concrete slabs. After the concrete slab has cured, tension is placed on cables that were placed in the form prior to pouring the concrete. These cables have a paper tube cover which prevents their bonding to the concrete. The span or loading conditions of the slab determine stress placed on cables.

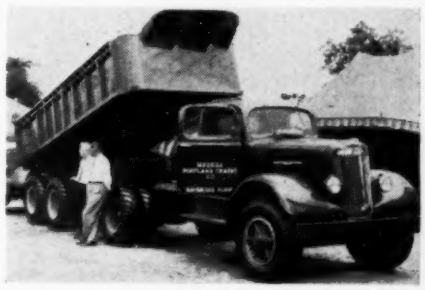
Rogers Iron Works Co., Joplin, Mo. A 40 to 50 t.p.h. hammermill impact crusher and a 21- x 40-in. primary jaw crusher, painted white for display purposes, were attractions. The hammermill is made in four sizes, ranging from 25 to 70 t.p.h. capacities, while the primary jaw crusher is produced in six sizes from 15- x 24-in. to 32- x 42-in. Features of the jaw crusher are a long jaw, welded steel base and all roller bearing equipped.

A 4½-cu. yd. Ransome Transit mixer truck on FWD chassis

Schield Bantam Co., Inc., Waverly, Iowa. On display was a 1/3-cu. yd. shovel, mounted on a model F-5 Ford truck. This company specializes on only one size of equipment, with interchangeable booms for shovel, dragline, trench-hoe, clamshell, pile-driver or crane. Features of these machines include: a bronze ring that takes all strain off center pin of mounting, which is near rear of truck to provide full circle swing; a self-energizing external brake on the boom hoist; ball bearings throughout for both swing shafts and internal expansion drum clutches.

Schramm Inc., West Chester, Penn. Display of this company's machines was set off by a low fence made from paving breakers set in the ground for posts and connected with air hose. Newest machine at this display was model 315, a rubber mounted 6-cylinder compressor rated at 315 c.f.m. and operating at 1180 r.p.m., direct-connected to a model 4DC-645 4-cylinder Buda Diesel engine. This company provides as optional equipment steel or pneumatic tires (or truck mountings); gasoline or Diesel engines in all but the largest size, 420 c.f.m., which is offered with Diesel power only.

(Continued on page 87)



A 15-cu. yd. dump body of Truck Engineering Corporation powered by White Motor Co. tractor

Looking down into silica quarry. Churn drill may be seen, above, with shovel loading quarry haulage unit, below. Crane in foreground is equipped with drop ball for secondary breakage of stone

TWO-MILE TRAMWAY From Quarry to Plant

Central Silica Co., Glass Rock, Ohio installs primary crusher in quarry and cuts haulage costs to plant with aerial tramway. Rod mills to replace chaser mills in plant; also install under-water screens

By DAVID MOCINE

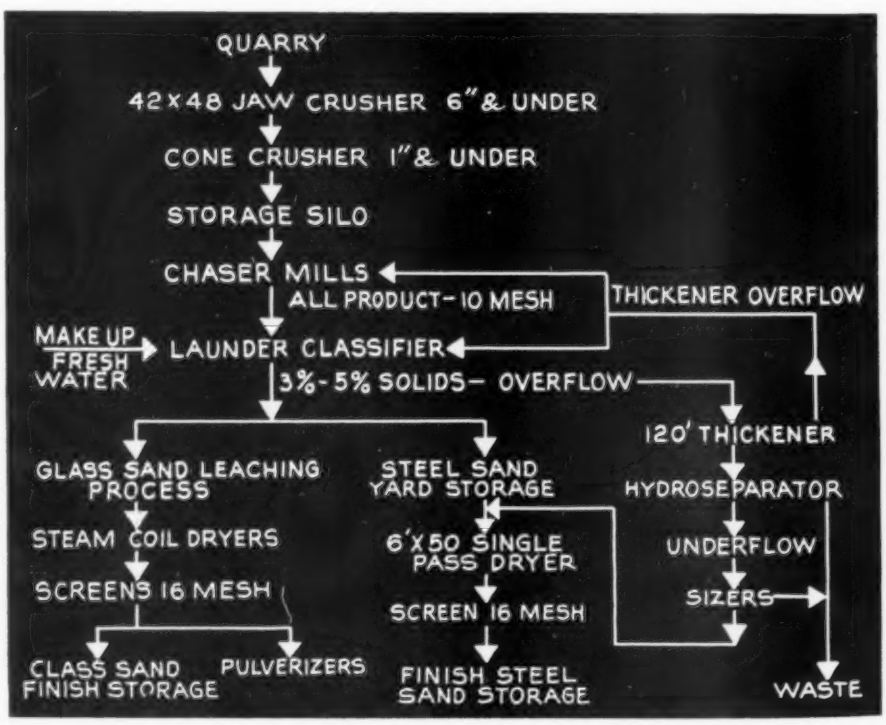
WITH completion of an aerial tramway on 7900 ft. centers connecting quarry to plant at its Glass Rock operation, Central Silica Co., Zanesville, Ohio, has accomplished the first step in a modernization program effecting the entire flow from quarry shovel to loading on cars for shipment. The tramway, replacing a three-mile truck haul to the plant over a relatively steep grade, does not materially increase production of steel foundry sand, glass sand and pottery flint, but it does allow day light quarry operation.

The tramway carries an average of 2000 tons of quarry stone per 8-hr. shift. A total of 72 buckets are suspended on the tramway at all times: 36 loaded with 1.8 tons each, traveling to the plant; and 36 empty, returning to the loading point at the quarry. There is always one bucket, uncoupled from the pull cable, under the loading spout, which, when filled, is returned to the line as another empty takes its place. The pull cable, traveling at 550-f.p.m., is in continuous motion and buckets are dumped to a silo at the plant terminus of the tramway without being unhitched from the pull cable.

Tramway Cable

Two separate flat strand, interlocked cables are used for supporting load or pulling buckets over the tramway. Diameter of cable supporting loaded buckets going to the plant varies according to length of span from 1½ to 1¾-in.; while the return cable supporting empty buckets is of 1¼-in. diameter. The pull cable, nearly 20,000-ft. in length, is all ⅞-in. in diameter. Buckets are loaded with 1.8 tons of minus 7-in. stone, making total weight of bucket and contents approximately 2½ tons. The quarry is near the top of a hill, allowing the entire 7900-ft. to the plant to be traversed with no angle greater than 2½ degrees over the slightly rolling terrain that intervenes. Power for the tramway is supplied at the loading end by a 100 hp. slip ring motor, with an electric brake, through a speed reducer. A hand operated brake is also supplied as auxiliary equipment in case of electric brake failure.

All controls on the tramway are electronic, requiring only a two-man operating crew. One man is stationed at the loading point where he is able to check arrival, filling and departure



Flow sheet of silica sand operations from quarry to storage

of buckets; and where the switch for starting and stopping the tramway is located. The second man, in charge of the tramway, spends several hours per day walking the distance between quarry and plant, checking all cable and fittings with field glasses. The entire tramway installation is of American Steel and Wire Co. design and fabrication.

Trucks for Long Haul Replaced by Tramway

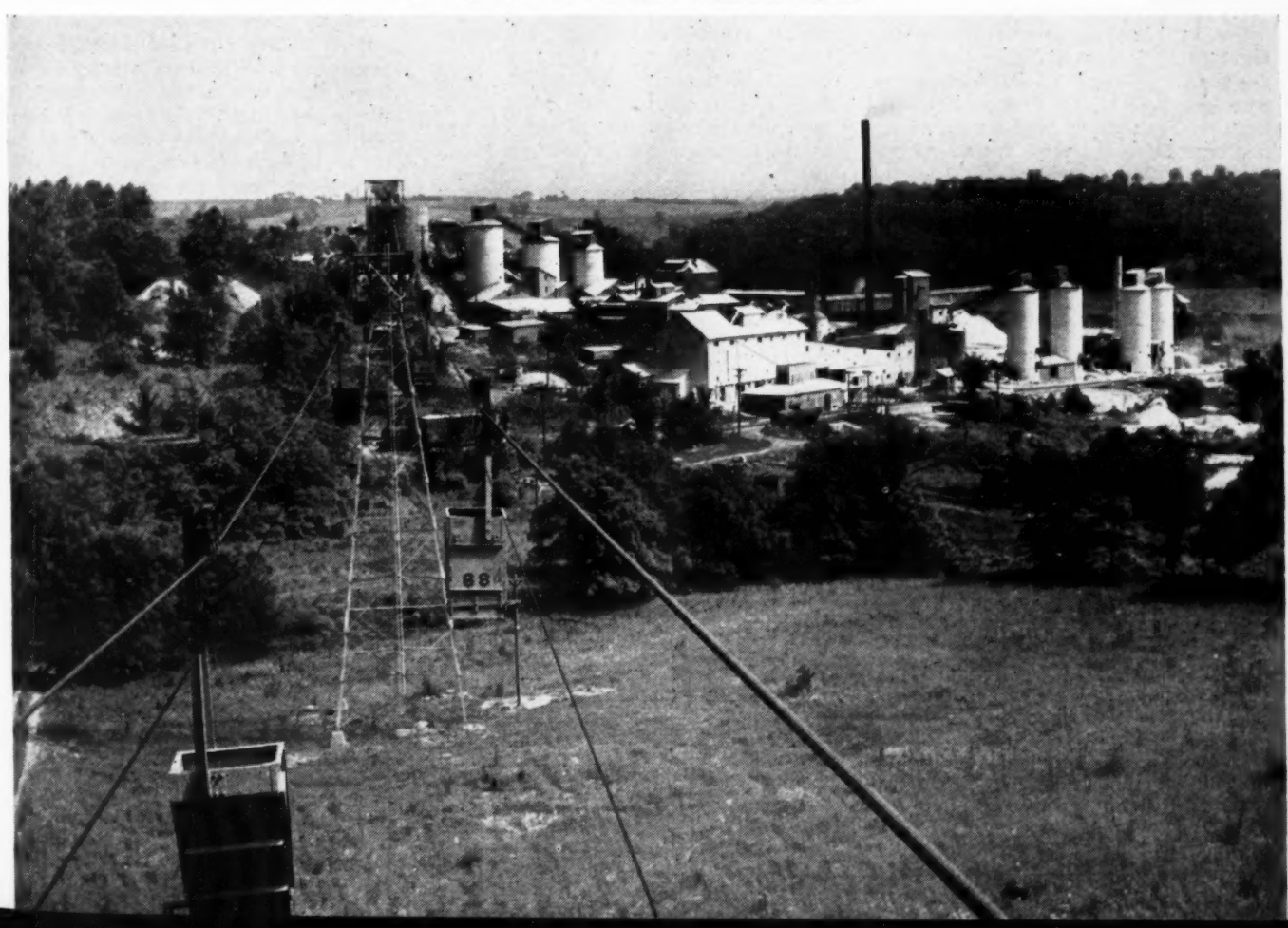
Prior to installation of the tramway, 12 truck tractors with 15-ton semi-trailers were in operation between quarry and plant two shifts per day, covering 6 miles per round trip over dirt roads, the steepest grade being approximately 17 per cent. With the truck haul, considerable time was lost due to impassable roads during bad weather; but no lost time has been experienced during even the coldest or wettest weather since installation of the tram-way, 10 months ago. Truck fleet operations were required two shifts per day in order to keep the plant operating, or a total of 24 man-days per 24 hours. The tramway operates one shift in order to keep the plant supplied for 24 hr. operation. Three trucks are required to supply the primary crusher processing stone for tramway feed — leaving a net saving of 21 man-days per 24 hrs.

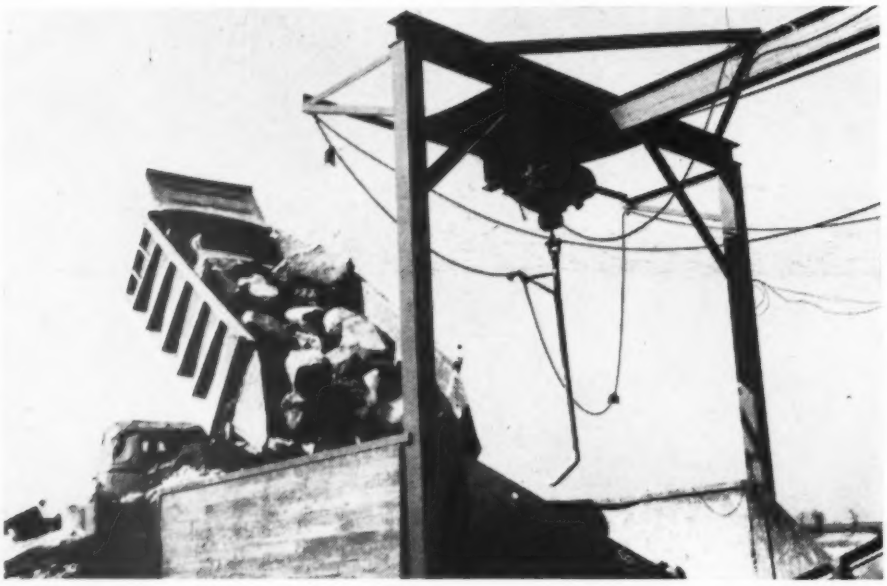
Central Silica Co. began operation of the Glass Rock plant in 1925, and since that time two quarries, both closer to the plant, have been worked out. The present quarry site was opened in 1936. Overburden, averaging 25-ft. is removed by a 1¾-cu. yd. diesel-engine powered shovel which loads two 10-cu. yd. hydraulically operated side-dump trailers, of Athey and Euclid manufacture, pulled by two tractors, an Allis-Chalmers HD-14 and a Caterpillar "60." Overburden is returned to the worked-out portion of the quarry, with the roadway for dumping constructed over previously dumped material.

A self-propelled, crawler-mounted, Bucyrus-Erie automatic-feed 7-in. churn drill sinks 50-ft. holes for quarry blasts along the 50-ft. face. An average of 5000 tons of rock are dislodged, using 6-in. 60 percent gelatine dynamite sticks with an average of 50 to 60 holes per blast. Blasts are fired with delayed-action blasting caps from a blasting machine. Secondary fragmentation is accomplished with a 4000 lb. round drop ball suspended from the 55 ft. boom of a Koehring crane. To take advantage of the greater capacity of the tramway over the truck

View of primary crusher building and tramway bucket loading plant. Truck in foreground is backing to hopper feeding primary jaw crusher. Conveyor from hopper inclines up to surge bin supplying tramway buckets

Tramway installation looking toward plant from quarry





A 15-ton semi-trailer dumping to hopper supplying primary crusher feed. Note dislodging hook connected to electric hoist on overhead crane spanning hopper and primary jaw crusher

haul, a 2½-cu. yd. Marion 93M shovel has been placed in service in the quarry. This new shovel, powered by a series 17000 Caterpillar Diesel engine, handles an average of 250 t.p.h. of quarry stone. Two additional shovels used at the quarry for overburden removal or cleanup are a 1¾-cu. yd. Diesel engine powered Koehring and a 1¼-cu. yd. gasoline-engine powered Osgood.

Haulage units from quarry face to primary crusher are three of the original 12 units used for plant haul, all 12 of which are kept in operating condition by rotating present quarry assignments. These units are 3½-ton Diamond T and G.M.C. tractors equipped with 15-ton Truck Engineering or Trailmobile end-dump semi-trailers. Present haul from quarry face to primary crusher is 250 yds. Quarry run stone is dumped to a 20-ton surge hopper fitted with a special drag feeder, engineered by R. W. McAllister, general superintendent. This feeder is comprised of 4- x 4-in. bars, 48-in. long attached to manganese steel chains on 3-ft. centers. Power for this feeder is supplied by a 25 hp. motor through a Jones speed reducer.

Ahead of the tramway is a new 42- x 48-in. Allis-Chalmers primary jaw crusher set for 7-in. discharge and powered by a 150 hp. motor. No grizzlies are used at either primary or secondary crusher stations at this operation due to the high clay content of quarry stone that tends to clog any form of separation at this point in the flow. Primary crusher discharge is to a 30-in. belt on 200 ft. centers which rises on a 20 percent incline for elevation to a 25-ft. diameter by 25-ft. high surge bin for the tramway bucket feed. As empty tramway buckets from the plant enter the loading building, they are automatically uncoupled from the pull cable by a tripping device. Buckets then move by gravity down an incline to the loading point, situated directly over the center-line of the tramway.

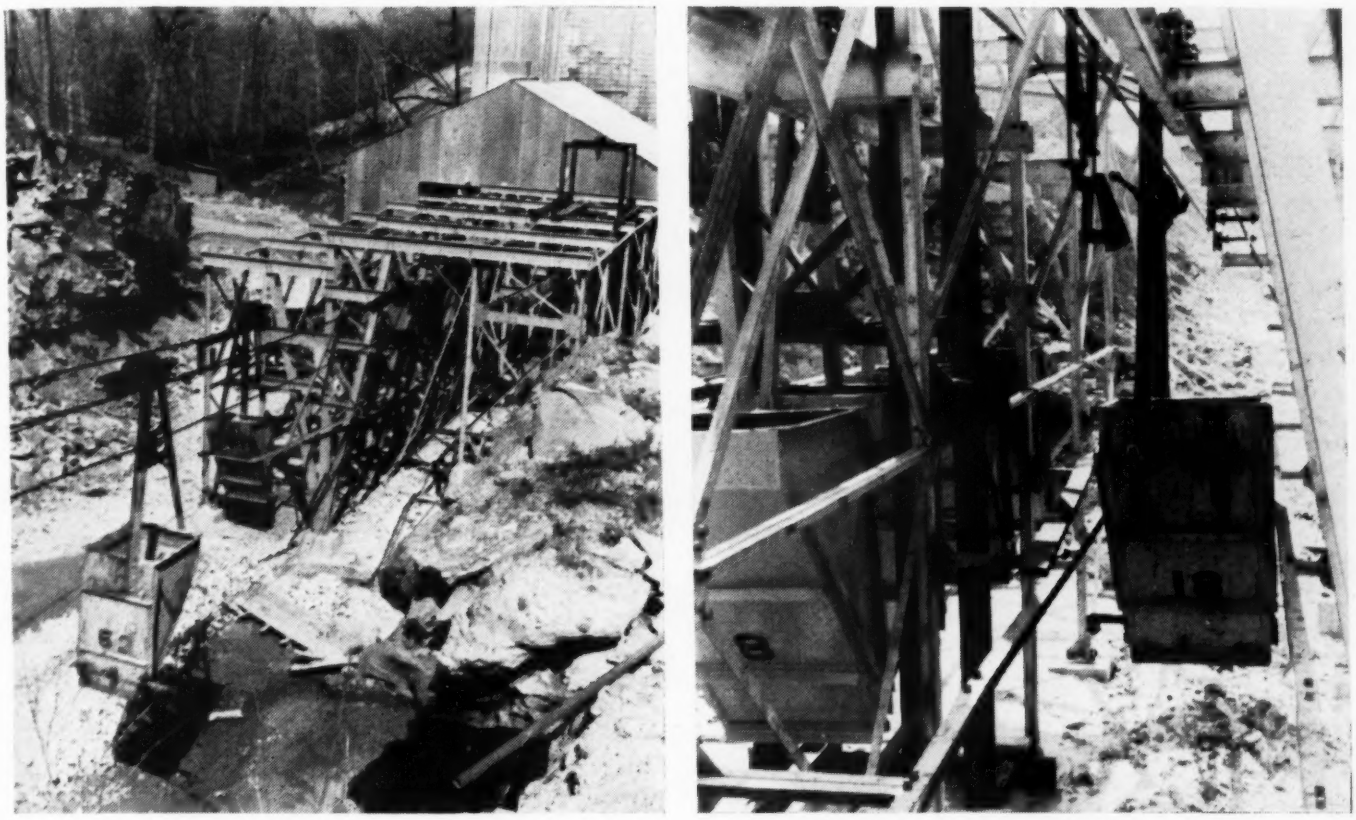
One of two flotation sections used in leaching plant for glass sand

Automatic Bucket Loading

Loading of buckets with minus 7-in. quarry stone is also automatically controlled. Incoming empty buckets are stopped directly under the loading chute by a block on the trolley line, with the weight of the bucket tripping a switch that starts the vibrating feeder under the surge hopper. When 1.8 tons of stone have entered the bucket, the combined weight of bucket and stone automatically stops the vibrator, cutting off flow of stone. Feed to buckets is controlled by a 42- x 72-in. Jeffrey electro-magnetic vibrating feeder. An empty bucket enters the loading building and a full one leaves every 27 sec., although it takes only 10 sec. to load a bucket. Departure of a bucket from the loading chute is controlled by an automatic timer that depends for activation upon the amount of pull cable passing a given point since the last bucket left the chute.

The loaded bucket, after being released from the loading chute, travels 25-ft. down an incline by gravity, attaining the same speed as the pull cable by the time the bucket trolley wheel passes through another tripping device that automatically clamps the bucket tow to the pull cable. At the loading end of the tramway a siding carries five spare buckets that can be inserted into the tramway flow with no loss of time when a bucket has to be cut out of line for mechanical failure or some other reason. By allowing a spare bucket to travel down a short incline to the loading spout at the same time a bucket is switched from the line at the opposite end of the spare rack, the pull cable does not have to be stopped and bucket alignment is kept in order. Spacing of buckets on the tramway is so perfect that at any time a loaded bucket passes an empty returning to the quarry, all other pairs of buckets are in perfect alignment. One of the 73 cars in constant use at the tramway carries an oil tank and pump for applying oil to the carrying cable.

At the plant terminus of the tramway, the line from the quarry passes directly over a 40-ft. diameter by 40-ft. high Marietta Concrete Stave silo, where the bottom dump buckets are tripped and automatically discharge their contents in the interval of travel



To the left: Tramway buckets entering and leaving loading structure. Note uncoupling device, upper-center, ready to uncouple bucket from tow line. To the right: Close-up of tramway buckets in loading structure

across the top of the silo. Upon reaching the far side of the silo the buckets enter guard-rails that prevent their swinging out while turning around a 16-ft. bull sheave to start the trip back to the quarry.

A 50 to 60-ton counter-balance weight is used to keep taut the loaded car carrying cable, while a 30-ton weight keeps tension on the cable supporting empty buckets on the return trip to the quarry. The tramway collects a large amount of static electricity, and as a result all 18 carrying towers are grounded in order to protect the workmen. Grounding is accomplished by means of a heavy copper cable connected to a pipe sunk 12-ft. into the ground that reaches moist earth at each tower.

Tramway Phone Installation

So that all interested parties may be quickly advised of any trouble developing on the tramway, a private telephone system is maintained between the loading terminal (where control switches for the tramway are located); the mid-way tension station, for possible use by the man walking the line; the discharge terminal; and the plant office. This system was installed and is operated by Ohio Bell Telephone Co., relieving Central Silica Co. of any concern with possible breakdowns or maintenance of repair crews. The system has worked out very well, and Central Silica Co. receives immediate attention from the phone company in case any trouble develops on the line.

Interest in the installation has reached far corners of the world, and when an executive of an Australian quarry operating company visited the Glass Rock plant, he wired his plant foreman, who flew all the way from Australia to Ohio in order to see the operation.

Sufficient quarry stone is dumped to the silo at the plant terminus of the tramway in an 8-hr. day to keep the plant operating 24 hrs. per day. Material is reclaimed from the silo by three 30- x 48-in. Jeffrey electro-magnetic feeders that discharge to a common 30-in. belt on 100 ft. centers for elevation to the secondary crusher. Three feeders are used under the silo

(Continued on page 106)

Shovel loading overburden strippings to 7-cu. yd. trailer drawn by tractor

A DUSTLESS PACKHOUSE

Two new Lone Star Cement Corporation packhouses at Birmingham, Ala., and Dallas, Texas, are models of cleanliness

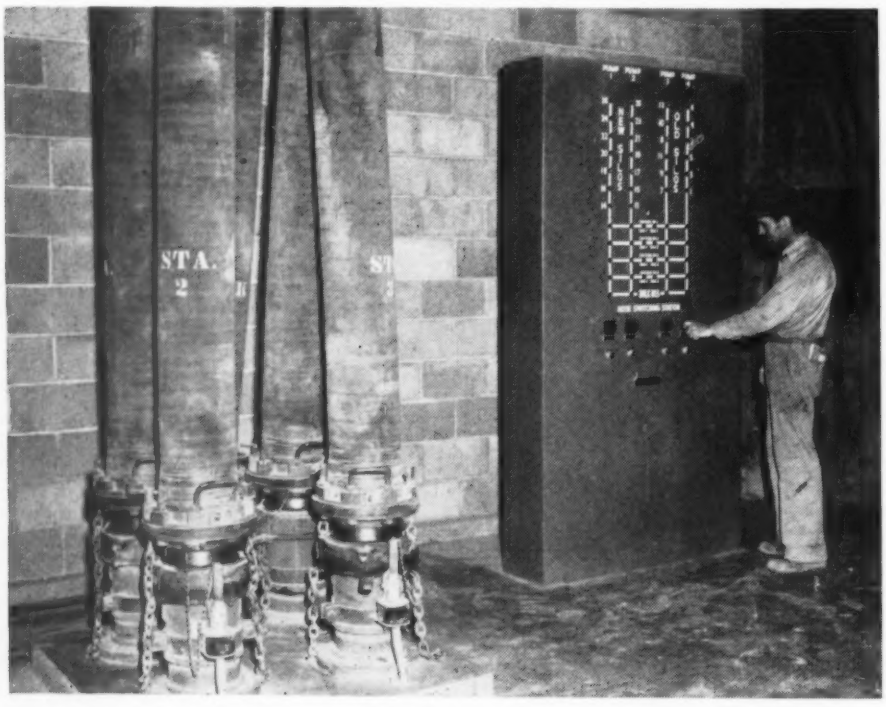
By W. B. LENHART

A VIRTUALLY DUSTLESS modern pack house was recently placed in operation by the Lone Star Cement Corporation at the Birmingham, Ala., plant. Three wet process kilns, 10- x 280-ft., are operated. The new pack house was designed to fulfill several equally important functions, but principally to permit a change-over to be made without any possible chance of small residues remaining in the system. The cut-off can be made easily, quickly, and cleanly so that the user of the cement is assured of getting exactly what he asked for.

Packing Machines and Conveyors Tied into Dust Collection System

Secondly, the pack house, designed with the idea of making it as dustless as possible, is setting a pattern in plant cleanliness that is outstanding, not only for the cement industry but for many others in the rock products industries. The air here is free from dust, floors are spotless, and the equipment looks like it had hardly been used. Not only do the working men appreciate it, the visitors like it, and what may have been overlooked, the customers like it. In this pack house, filled paper bags come off the St. Regis packers automatically and fall onto the woven wire conveyor system, which is connected to the dust collector system. The net result is that cars are loaded with sacks that are clean and bright and remain that way. When these same sacks are unloaded they are clean and easy to handle. One could almost unload such sacks wearing a business suit without fear of soiling his clothes.

The same theme of cleanliness is carried out from the packer stations to the bag cleaning department. Each of the four packer stations and the sack cleaning section has its 12-ft., Sly dust filter with the Clarage fan drawing the material into the filters. The six dust filters function so smoothly that the fans discharge into the room and not to the outside, yet there is not a particle of dust coming from the fan unit. Dust collection, carried out in this manner, means that if any of the filters are working improperly, the pack house foreman knows it almost instantly and can make proper corrections.



To the right, L. T. Turner, packhouse foreman at the switch board which controls flow of material to each packer station. To the left are five 8-in. dia. hose connections by means of which cement can be delivered to any of the packing stations

Vacuum Cleaner System Supplements Dust Collectors

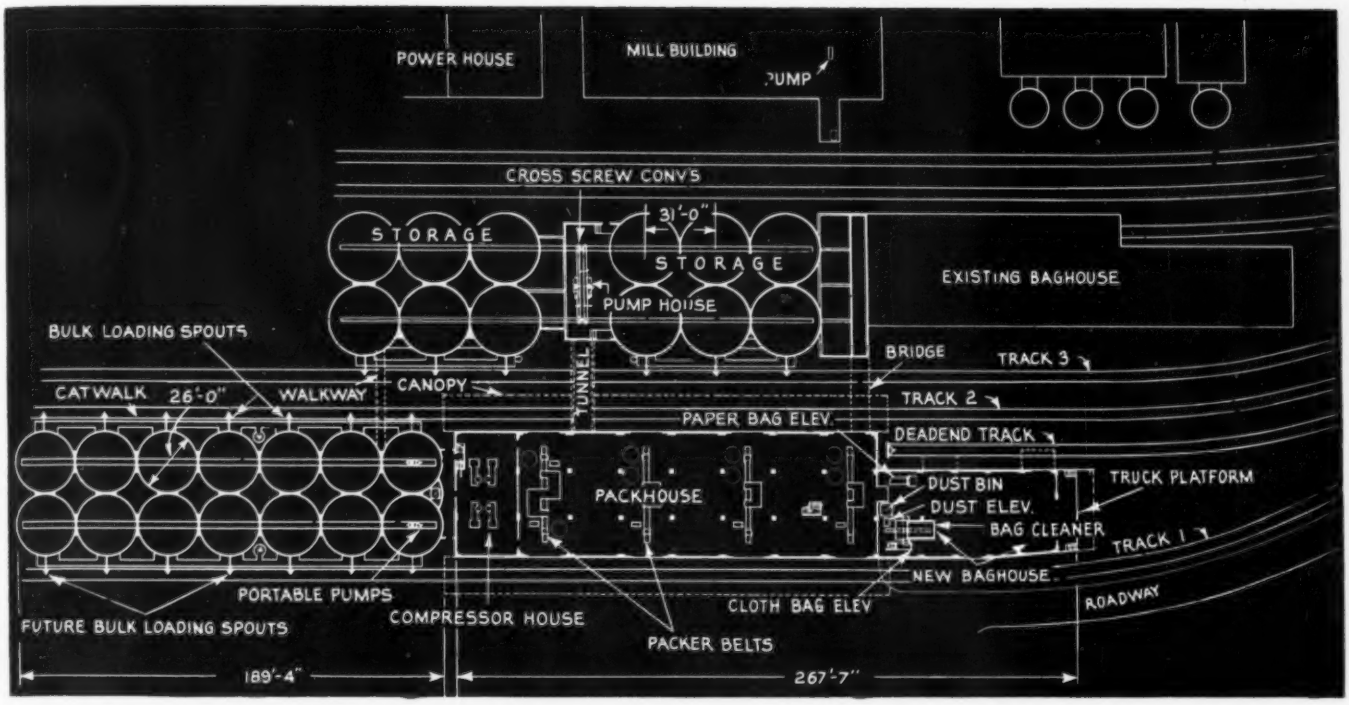
Augmenting the dust entrainment equipment is the vacuum cleaner system for keeping the floors and equipment spotless. Throughout the new building are 35 vacuum hose connections or outlets so that the operator can connect the floor cleaning equipment to any of these outlets and proceed with the clean-up similar to a modern hotel system. This equipment uses a 6-in. rotary Allen Billmyre vacuum pump driven by a 15-hp., U.S. motor. Entrained dust from the floor cleaning equipment passes to two small, cyclonic-type collectors. Coarse material is caught in the first collector and the finer material in the second. The collectors are emptied manually to open-mouthed bags. All cleanings are discarded. The first collector is 2 ft. in dia. and 6-ft. high, and the second is 3 ft. in dia. and 8 ft. high. The vacuum pump assembly is mounted on the top floor of the building, but the small collectors are on the main packer floor.

Safety is Built Into Plant

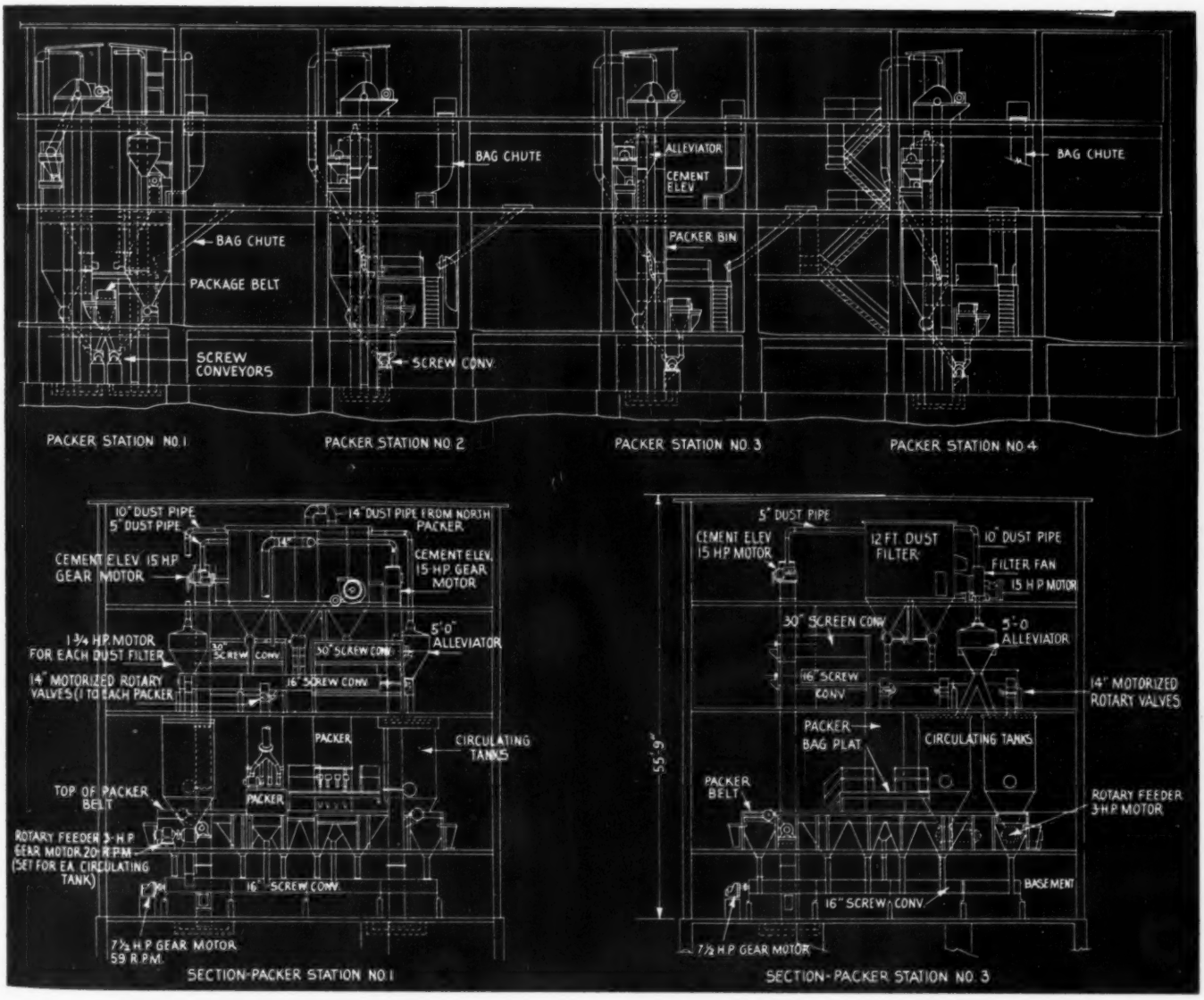
Thirdly, the plant has been designed for safety to the workman. All moving parts are adequately provided with steel housings. Stairways are provided with suitable hand and knee rails, and all openings to chutes for delivery of empty sacks to each station are adequately protected. Under the new silos the two Fuller-Kinyon pumps have been provided with a hand rail that goes entirely around the top of the pump section. This rail is of 1½-in. pipe. As additional protection there are four sheet metal guards, and the whole unit is so designed that when the pump is pushed from silo to silo there is no chance of the workmen getting fingers caught between the top of the pump and the bottom of the rotary valve. This same attention to safety detail is carried throughout the new plant.

Packing Operation

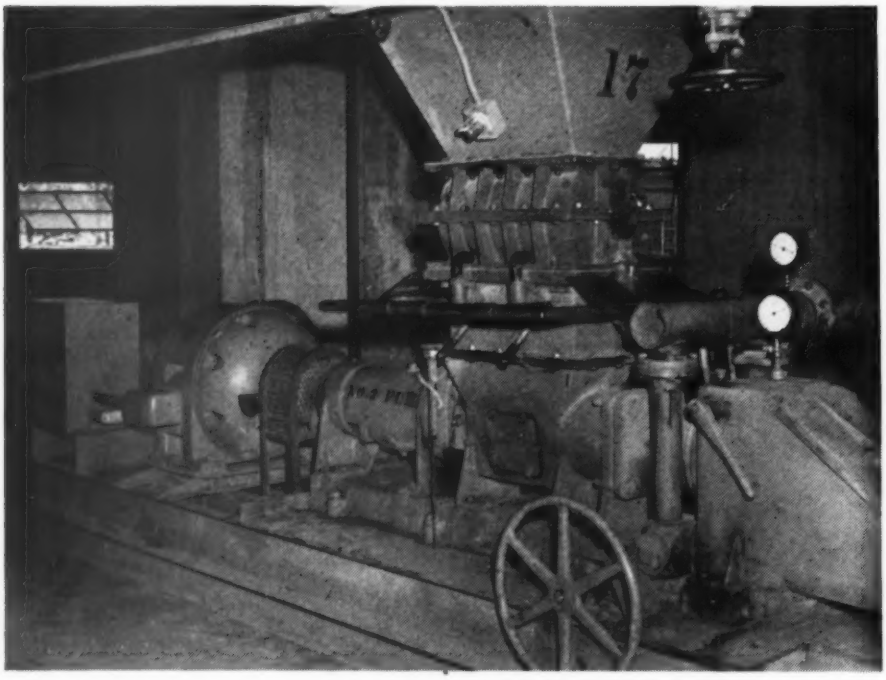
Fourthly, the sacking plant is designed for efficient and fast operation and is capable of a high output.



Plan details of modern, dust-free packhouse



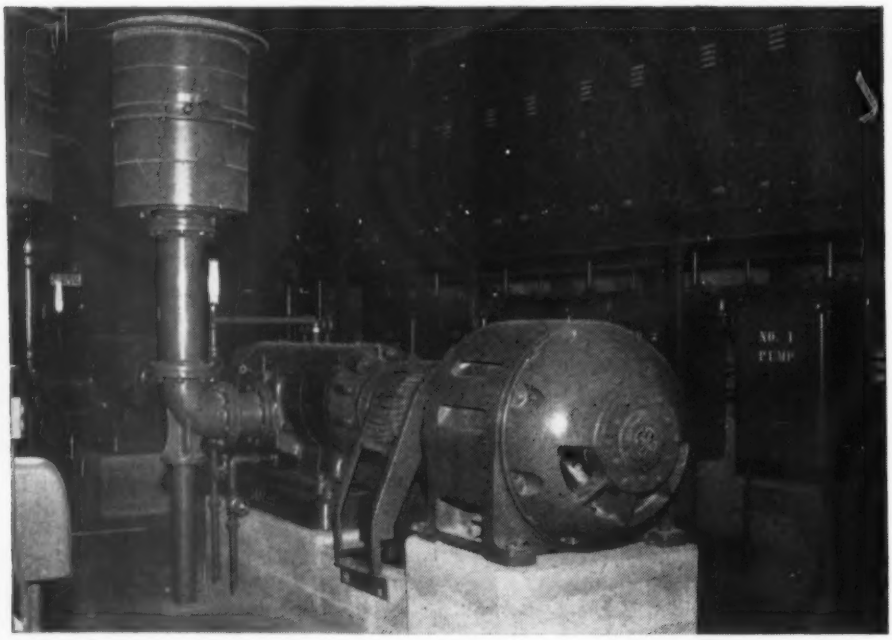
Elevation details of new packhouse with section views showing two arrangements of packing stations.



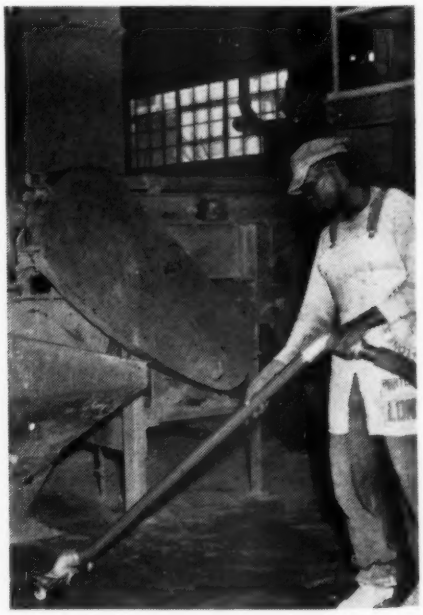
One of the two 8-in. cement pumps. Note the hand rails below the rotary valve ahead of the pump to make it easier to push equipment over track

There are four packing stations, each essentially alike. Stations No. 2, 3 and 4 are exactly alike and will be described in detail first. No. 1 will be used later for mortar cement and it is essentially two separate units, but assembled to serve one packer. Stations No. 2, 3 and 4 are designed to handle two different kinds of cement with a circulating tank for each kind of cement. Each station has a No. 150-F.C., 4-tube, St. Regis sacking unit. This automatic machine is fast and extremely accurate. The operator, from his sliding seat, puts the sack on the tube, presses a conveniently located button just above the tube, and the rest is automatic. The sack fills in 6 to 7 seconds, there is a slight delay so that the sack can deflate and relieve any back pressure, then the sack is pushed off the tube and falls to the off-bearing chain conveyor that delivers it to the loading apron. Electronic devices control the packer's automatic features. The 2- x 2½-in. rectangular blades on the packer give a faster filling rate than the old style blades that were shaped more like a truncated triangle. Each pack station is rated at 250 bbl. of cement per hour or 1000 sacks per hour.

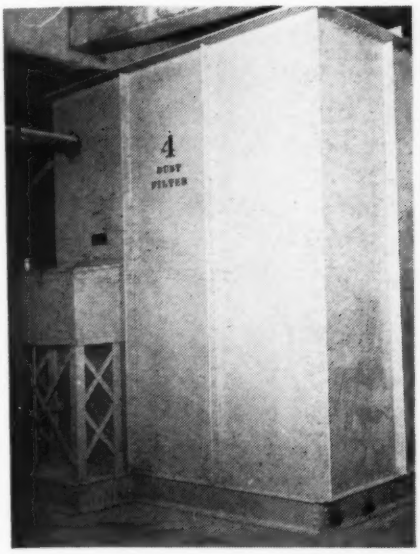
On the main packing house floor, which is 159 ft., 6 in. long, a packing station is located at each end with the other two equally spaced along the length. Each station takes up 22 ft., 6 in. of this length, and the designers have allowed this same amount of floor space between each packing station so there is a roominess about the place that is pleasing. Railroad car tracks "Wye" to permit loading cars on both sides of the building on its long axis. From the sacking machine the sacks fall to the 30-in. wide steel woven wire conveyor that operates at right angles to the long axis of the building. The direction of travel of these conveyors is reversible. The main conveyor delivers sacks at each of its two ends to a short conveyor of similar design and at slightly lower elevation. This short conveyor moves sacks to the loading apron at each end from which they are placed manually on the loading trucks. The end of the loading apron is about 5 ft. from the edge of the building. Any damaged or broken sacks at the loading apron can be shoved to a screen-covered hopper alongside the unit and the contents delivered back into the sacking system. Under the entire conveying system are six steel hoppers that are located, for the most part, above the floor line and deliver to a 16-in. screw conveyor located in the sub-basement of the building. This screw conveyor delivers cement from torn bags to a vertical bucket elevator that returns it to the third floor where it is discharged over a 30-in. screen conveyor which screens out any small pieces of paper. Cement passing the screen is conveyed by another 16-in. screw conveyor over the top of the steel bin serving the packing machine and then on to the two cir-



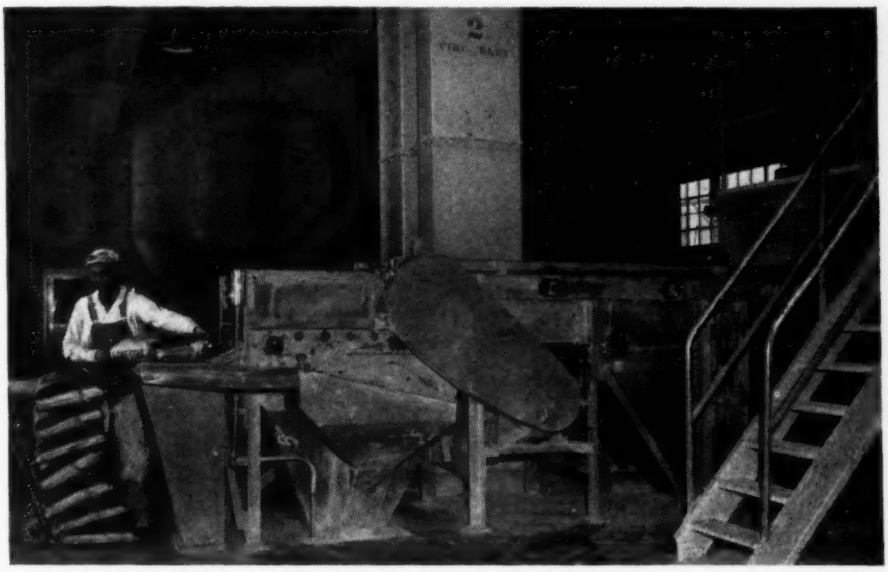
One of the rotary compressors. There are four of these units on the main floor of the packhouse. Control equipment may be seen in the background



Packhouse is provided with 35 outlets to which the vacuum cleaner can be attached, similar to hotel practice



On the top floor of this three-story structure are the dust filters. Three packing stations are served by one filter, one station is connected to two filters, and the bag cleaning section is connected to another filter, a total of six



Off-bearing conveyor from each packer station is reversible so that railroad cars can be loaded on each side of the building. The conveying system is enclosed in a steel housing and connected to the dust collector system

culating bins. All of this assembly is connected to the dust collecting system.

Cement pumped from the silos to any one of the four stations is received at each station in a 5-ft. "Alleviator" where air from the Fuller-Kinyon pumps is vented to the dust collectors. The Alleviator at stations No. 2, 3 and 4 can discharge by gravity to one of two circulation tanks. The flap gate valve for each set of two tanks is hand set and connected to a limit switch that indicates on the control board into which circulating bin the cement is going. Each circulating bin is intended for one of the two kinds of cement sacked. The circulating bin in use discharges through a rotary valve with both valves being driven by a 3-hp. motor with the valves running at 20 r.p.m. They discharge to the previously mentioned 16-in. dia. screw conveyors located in the sub-basement. Each screw conveyor is driven by a 7½-hp. geared-in-head Sterling motor. Circulating bins, circular and cone-bottomed, each hold 75 bbl. of cement, and are provided with "Bin-Dicators" that fill to a high-low point and are tied in with the F-K pumps under the silos.

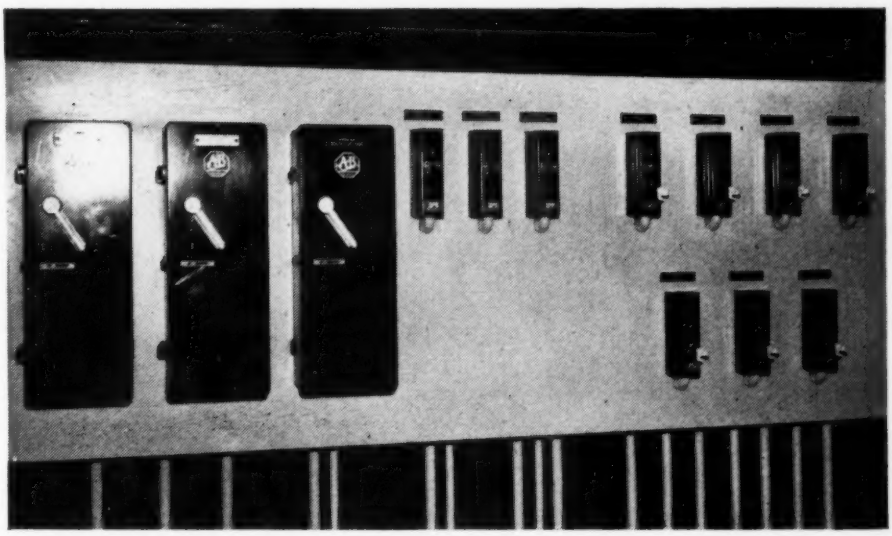
Thus the circulating bin in use discharges consecutively to the screw conveyor in the basement, the bucket elevator, the 30-in. screen conveyor, and finally to the 16-in. screw conveyor above the packer. When the packer bin is full the excess is carried back to its circulating bin by this second screw conveyor. Dust from the Sly dust filters overhead discharge to this same screw through a small rotary valve that is driven by a ¾-hp. motor. The second screw conveyor, it will be seen, has three outlets; (1) to the packer bin, and (2) and (3) to the circulating bin, and each of these outlets is provided with a rotary valve powered by a ¾-hp. motor. The bucket elevator at each of these stations has a 15-hp. motor. The filter fan likewise uses a 15-hp. motor. Thus it will be apparent from a study of the drawings that the cement is in an individual closed circuit so that when it is desired to change from one kind of cement to another the system functions so that all the cement in the system is returned to its circulating bin and held there until it is wanted again.

Station No. 1 is essentially the same except that it has two separate screw conveyors in the sub-basement, two separate 30-in. screen conveyors, separate Alleviators, separate circulating tanks, and these serve one packer and belt conveyor system.

The Chain Belt Co., Continental Gin Co., and the Link-Belt Co., all supplied portions of the elevating, conveying and safety guard equipment.

Large Storage Capacity

Adjacent to the pack house are 14 new reinforced concrete silos, each provided with self-cleaning hoppers. Each silo holds 11,000 bbl. of cement and each are filled by F-K pumps from the finish section of the mill. The coned-bottoms of each silo are circular and of steel with air inlets to the hoppered bottoms so the cement therein can be loosened if needed. Silos are arranged in two rows of seven silos each and the interstices are not used. The silos, which are 26 ft. in diameter and 82 ft. high above the coned section with a total height of 101 ft., are provided with bulk loading facilities to the two tracks laid parallel to each row. Two



For each packer station there is installed a control panel which gives the foreman a check on operating conditions

New storage silos and packhouse at Dallas, Texas, plant of Lone Star Cement Corporation

of the silos are being reserved for masonry cement. Track scales and steel canopies over the loading sections for protection during wet weather are features of the new plant. The old pack house has been changed over for bulk loading purposes. With the 14 new silos, the plant has a total of 26 silos. The older silos are filled by bucket elevators and screw conveyors.

Under each of the new silos are two, 8-in. dia. discharge, Fuller-Kinyon pumps each connected to a type K, code F, 100-hp. G.E. motor. Air agitators are provided ahead of the rotary Fuller cement valve at each machine. The motor circuit is tied in with the Bin-Dicators and to the main switch board on the main packer floor where colored lights indicate to the pack house foreman which silo is being emptied and to which circulating bin the cement is being pumped. The F-K pumps, mounted on the conventional track, are hand-moved from silo to silo. Quick opening clamps permit the unit to be dis-assembled, moved and re-assembled in about 15 minutes.

Packing out cement at new Lone Star packhouse at Dallas, Texas. Plant features clean packaging and cleanliness throughout

At one end of the group of new silos, a modern elevator has been provided for the use of the staff and operators. It was supplied by George T. McLauthlin Co., Boston, Mass. It has all the safety features required of a modern office building elevator, operates similar to all "self-service" elevators, and will handle a load of 1200 lbs.

Between the nest of new silos and the main pack house are located the four Fuller rotary blowers. These are Type C-250 and operate at 37 lbs. maximum pressure. Each is driven directly by a 125-hp. type K, Code F 2200-volt, 585-r.p.m. G.E. motor. Each compressor is on its own pump, with the other two pumps located in the finish end of the mill.

A convenient stairway connects the top of the new silos with the old as there is about a 20-ft. difference in elevation between the two nests of silos. A tunnel also connects the old and the new group of silos so that the operators have a convenient method of reaching all parts of the storage facilities.

Two F-K pumps deliver to a hose switching station located near the main control panel on the main pack house floor. This hose switching station consists of five lengths of 8-in. cement transporter hose mounted vertically. The purpose of these switching hose lines is to enable the opera-

tors to deliver cement from any silo to any of the packing stations. Each hose is suitably marked and near the base is a contact switch, that, when the hose connection is made, is plugged into a circuit that indicates on the control panels the status of the loading situation. There is one main switch and indicating panel for the silos and loading mechanism, and each pack station has an individual panel that controls that section and indicates the related features at that station. The first control panel was supplied by the Fuller Company and the latter by the Allen-Bradley Co.

At the opposite end (from the silos) of the main structure a new sack cleaning section has been provided. The cloth sacks first go to the sack cleaning wheel after which they are transferred to the cloth sack elevator that discharges to a sorting belt with five stations. The sorting belt is driven through a Foote reduction unit. The coarse dust from the cleaner goes to a 12-in. screw conveyor, and then to a bucket elevator that discharges to a dust bin. The fine material goes to a dust collector that discharges to the dust bin. The dust bin is emptied via a one tube packer. The sorting belt is on the second floor of the main building. Paper sacks are elevated to the third floor by an elevator that is driven by a 5-hp. motor through a geared-in-the-head motor.

Upper floors used for sack storage have ample room for storing upwards of 800,000 paper bags. Paper bags are stored on wood mats to keep them off the concrete floors. Convenient steel chutes are provided to each packing station so that empty sacks can be sent to the sacking machine platform. In addition to these chutes there are about a dozen, conveniently located waste paper chutes to aid in keeping this modern pack house neat and clean. A hatchway with rope or chain blocks is provided for machinery parts. On the main floor is a set of Toledo platform scales for check weighing purposes.

The McDonald Engineering Co. designed the pack house and silos. The George A. Fuller Co. built the silos and pack house, and the William Neill Company sub-contracted the cylindrical portion of the silos.

Building Structural Details

The main pack house is 159 ft. 6-in. long by 54 ft. 4-in. wide. It is three stories high plus a sub-basement. The sub-basement is 9 ft. high, the main floor 18 ft. high, the second and third floors are each 14 ft. high.

The air compressor room is 28 ft. long and 54 ft. 4 in. wide. The sack cleaning section is a one-story structure, 80 ft. 1 in. long and 35 ft. 10 in. wide.

All the buildings are of reinforced concrete and steel for the main column and truss sections with concrete floors. Wall areas between the outer columns are of Birmingham slag concrete block. Convenient shower and change rooms are built of concrete blocks made with Superock lightweight aggregate. On a mezzanine floor near the center of the building is a glassed in office for the use of the operating personnel.

In addition to the two tracks that serve the loading section, a third short stub track is provided permitting cars containing empty sacks to be unloaded at the bag cleaning section without interfering with the loading operation. The plant is served by tracks of the L and N, Southern, Central of Georgia and other railroads. The company has its own switch tracks.

Alabama division official personnel includes: C. E. Fontaine, vice-president and general manager; John O'Callaghan, general superintendent; L. T. Turner, pack house foreman; L. K. Briley, chief electrician; and H. A. Williams, chief chemist.

Road Show Exhibit

(Continued from page 77)

SKF INDUSTRIES, INC., Philadelphia, Penn. Backdrop of this booth carried transparencies of typical equipment incorporating SKF bearings, and on a shelf across the back were mounted cut-away samples of bearings and pillow blocks. Three items were stressed as being new additions to the line: self-aligning ball-bearing pillow blocks with a new type of construction for ease of mounting; a new spherical roller bearing and spherical roller thrust bearing.

T. L. SMITH CO., Milwaukee, Wis. Three complete transit mixers for ready mixed concrete were displayed. No. 5½ Smithmobile, a 5½-cu. yd. capacity mixer (or 7⅜-cu. yd. agitator), mounted on a 6-wheel Autocar chassis. Weight of truck, mixer body and capacity load would equal 53,000 lbs. A 3- and 4½-cu. yd. mixer were mounted on an FWD chassis and an International 11-KBF chassis, respectively. All transit-mix trucks had steps and platforms built around them to facilitate inspection. A cut-away model of a 3-cu. yd. mixer body was located at ground level. Newest piece of equipment at this display was a cement spreader that is attached behind a dump truck for cement spreading on soil stabilization jobs.

TIMKEN ROLLER BEARING CO., Canton, Ohio. Particular emphasis at this booth was placed on the newest unit now in production, a carbide rock bit. According to the manufacturer, this bit has been developed primarily for extreme rock conditions where its super hardness, drilling speed and endurance assure utmost economy of time and cost. Around the edges of the booth were illuminated show cases with all types and sizes of anti-friction bearings produced by the company. The statement was made that 92 percent of equipment manufacturers represented at the Road Show use Timken Bearings.

TRUCK ENGINEERING CORP., Cleveland, Ohio. One of a fleet of dump bodies manufactured by this company and in use by a cement company on a haul from pit to plant was exhibited. The trailer, a 15-cu. yd. hydraulic dump unit, was shown with a WB-26 White Motor Co. tractor, powered by a 145 hp. gasoline engine.

TYSON BEARING CORP., Massillon, Ohio. Bearing samples and literature emphasized the company's recently added line of small bearings (formerly this company manufactured only large bearings). Feature of these bearings is cageless construction carrying a full complement of rolls.

WALTER MOTOR TRUCK CO., INC., New York, N. Y. Model AWVD, a 260 hp., 126-in. wheelbase, 66,000 lb. gross vehicle weight Diesel powered tractor for off highway ore trailer hauling was exhibited by this manufacturer. This unit is capable of handling a 35 ton capacity trailer, and is equipped with power steering through a hydraulic booster. Other models shown were the AGRL, a 240 hp. truck with a gasoline engine; a model AWUS, powered by a 250 hp. gasoline engine and a maintainer with under body blade, model FZMS, powered by a 125 hp. gasoline engine. Also demonstrated was a cut-away model of the Walter Automatic Lock Differential.

WAUKESHA MOTOR CO., Waukesha, Wis. Ten engines were on display with emphasis being placed on the new Diesel, model WAKD, which develops 205 hp. at 1400 r.p.m. Models 190-DLBU and 190-GKU, Diesel and gasoline engines, respectively, both built on identical crankcases also were shown. Engines ranged from 20 to 225 hp., and from 61- to 1894-cu. in. displacement.

S. K. WELLMAN CO., Cleveland, Ohio. Large illuminated work photographs of construction equipment using Velvetouch clutch and brake linings formed the backdrop. Literature was available giving equipment applications for all standard makes of earthmoving machinery.

WINCH-LIFT, INC., Shreveport, La. A 12-cu. yd. end-dump body powered by an F-8 145 hp. Ford tractor was continuously demonstrated at this booth. The demonstrator used a Tulsa winch, although any suitable winch may be used. According to the manufacturer, dumping mechanism and body design of these dump trailers allows the use of a lower rated tractor than with other types of bodies of similar capacity. Bodies from 8- to 20-cu. yd. capacity are now in production.

The COST of Lime

Interesting analysis of gains to both labor and industry through modernization and new installations to increase plant efficiency

By GORDON R. LACY*

Gordon R. Lacy

SOME schools of economic, political, or social thought seem to be based on the idea that financial returns from industry should go primarily to the labor section of the industry. Others believe that the returns are due principally to the management group. Thus, when there is a conflict of these two groups, or ideas, within an industry, the potential overall efficiency is very definitely impaired, and not to the detriment of just one side or the other, but very definitely to both sides.

When both parties fully realize their duties and obligations, not only to themselves, but to the other group as well, both will benefit in a manner perhaps far beyond their expectations. It is our thought to discuss what can be done in the lime industry by each group for the mutual benefit.

In the past years, lime plants depended on a multiplicity of low capacity units to give a reasonably high overall plant capacity. Today the trend is definitely toward a much fewer number of high capacity units to give the same or greater overall capacity. At the same time, efficiency of the modern units is greater, with a general net improvement both to management and labor.

However, to make these gains, both labor and management must do their parts. To demonstrate this, we are going to outline several hypothetical methods of operation, developing ultimate cost of lime against a reasonable mill net price, showing the part that the two major groups must play for the common good.

Typical High Cost Operation

For all of these cases we will assume the following conditions:
Each plant operates 300 days per year. The average labor rate in all cases is $1.00 per hour unless noted otherwise.

Costs will be divided into the following major parts; all per ton of burned lime loaded on cars for shipment:

1. Stone cost†.
2. Burning labor (includes charging kilns, firing, and drawing labor).
3. Fuel cost based on use of producer gas as fuel.
4. Fixed charges.
5. Variable charges such as repairs, power, etc.
6. Sorting and loading labor.

Case "A" will be used as the base of our discussion. It is a plant operating 10 hand-fired, natural draft kilns, making 10 tons of lime each per day, or 30,000 tons per year. In such a plant the quarry operation ordinarily will be rather inefficient and expensive and a stone cost of $2.50 per ton of lime can be expected today. This figure brings the stone to the foot of the charging incline only, ready for hoisting to the kilns. Labor requirements for this plant will be as follows:

- 2 men hoisting stone and filling kilns, 8 hours each;
- 12 men firing kilns (4 per shift), 8 hours each;
- 2 men handling coal and ashes, 8 hours each;
- 6 men drawing kilns (2 per shift), 8 hours each;
- 3 men sorting and loading lime, 8 hours each.

The total burning labor is 176 man hours and 24 man hours for sorting and loading.

With hand firing, a 3:1 fuel ratio may be average and we will assume a $7.50 delivered coal cost.

Fixed charges on the kiln plant and lime handling to cars can be based on 15% per year on $150,000 capital investment because this type of plant is quite old and probably pretty well written off.

Repairs will be another $.15 per ton of lime and other controllable items will add another $.60 for a total of $.75.

Summarizing these costs we have:

Stone	$2.50
Burning labor	1.76
Fuel	2.50
Fixed charges	.75
Variable charges	.75
Loading labor	.24
	$8.50

Any increase in plant production with this type of kiln will not make any marked reduction in this figure due to high fuel and labor requirements to the kilns.

With a mill net of $8.50 what do we have? We have nothing but a lot of hard work and nothing to show for it. And if conditions do not maintain the average used, we might better mail a check to the customer for the loss entailed and save the headaches of making and shipping the lime.

What, then, is the next step? It is higher, more efficient production with resultant lower costs. What do we do to get this? Two courses are open, depending on local conditions. One is to remodel existing kilns for improved performance. The other is to abandon the old kilns and build a completely new, modern plant.

Remodeling to Increase Efficiency

In Case "B" we will look at the possibilities of remodeling existing facilities. If the kiln are of reasonable height and shell diameter and in fair to good condition externally, there are very definite possibilities along this line. Application of induced draft with center burner firing of producer gas and hot zone recirculation have in many cases made 30 to 40 tons kilns out of those previously capable of making not over 10 tons per day.

Let us assume an increase to 35 tons per kiln and that only five kilns are remodeled for a daily production of 175 tons. The other five kilns will be disregarded and left idle. Each of the five kilns should be remodeled for about $25,000 including gas producer facilities. With a carry-over of another $100,000 in capital values, fixed charges will be based on $225,000.

Stone cost, assuming no quarry improvement, may reduce to about $2.30 due to increased demand. Labor requirements will be:

- 3 men charging (1 per shift) 8 hours each;
- 6 men firing (2 per shift) 8 hours each;
- 3 men drawing (1 per shift) 8 hours each;
- 3 men handling coal and ashes and general utility (1 per shift) 8 hours each;
- 3 men sorting and loading (1 shift) 8 hours each;

*Azbe Corporation, St. Louis, Mo.

†See author's article Rock Products, May 1947.

Fuel ratio should be a minimum of 5:1 on producer gas which will require a little better coal than hand firing, say $8.00 per ton delivered. Repairs and variable will be about the same as in case "A," some more on repairs due to higher forced production and some less on other variable items due to increased production. A summary of Case "B" costs gives us:

Stone cost	$2.30
Burning labor	.69
Fuel	1.60
Fixed charges	.79
Variable charges	.75
Loading labor	.14
Total	$6.27

Now we are getting somewhere, showing a gross profit of $2.23 on a mill net of $8.50. But we will come back to this later.

Economics of New Kilns

As Case "C" we will consider the abandoning of all the 10 old kilns and installing five new kilns each adequately designed and arranged for the production of 50 tons of lime each per day. This will require an investment of perhaps $500,000 to install for producer gas firing and to enlarge existing lime handling facilities. Operations are mechanized to the highest degree and require a minimum of help to operate.

At the same time, no doubt, stone production facilities will have to be overhauled to handle the requirements for 250 tons of lime per day. In spite of added capital investment, increased tonnage and efficiency should bring the cost down to $1.50 per ton of lime. It has been done by many operators and credit is due to intelligent planning by management and cooperation by labor.

Labor requirements for the five new kilns should be:

1 man charging 8 hours;
6 men firing (2 per shift), 8 hours each;
3 men drawing (1 per shift), 8 hours each;
3 men coal, ashes, and utility (1 per shift);
4 men loading and sorting.

Fuel ratio should be 5:5:1 for $8.00 coal and controllable items about the same as in Case "A" or "B." Summary of Case "C" gives us the following:

Stone cost	$1.50
Burning labor	.42
Fuel	1.45
Fixed charges	1.30
Variable charges	.75
Loading labor	.13
Total	$5.55

Now we find a gross profit of $2.95 from a mill net of $8.50. Bringing all three cases together we see what the results can be at the end of a year's operation under any of the cases. This is shown in Table "A."

All of these improvements assume complete cooperation of management and labor. The former must provide the necessary capital to install modern efficient equipment.

TABLE A

	Capital Investment	Annual Production Tons	Mill Net Per Ton	Production Cost Per Ton	Gross Profit Per Ton	Sales and Administration Per Ton*	Net Profit or Loss Per Ton	Net Annual Profit or Loss
A	$150,000	30,000	$8.50	$8.50	$ —	$2.12	$2.12(x)	$63,600(x)
B	275,000	52,500	8.50	6.27	2.23	1.57	.66	34,650
C	500,000	75,000	8.50	5.55	2.95	1.39	1.56	117,000

TABLE B

	Annual Production	No. Extra Men at $8.00 Per Day	Extra Cost Per Ton	Production Cost Per Ton	Sales and Administration Per Ton*	Net Per Ton	Net Annual Profit
B	52,500	7	$ .32	$6.59	$1.65	$ .24	$12,600
C	75,000	8	.26	5.81	1.45	1.24	93,000

(x) Loss
* Assumed 25% of production cost

The latter must do its part by working efficiently with a reasonable minimum crew. We believe that the labor requirements in the burning department as listed are adequate based on the fact that there are smoothly operating plants operating with similar crews.

If management refuses to provide any modern efficient equipment, there is but one answer for both parties in Case "A." It is failure. If it provides the facilities as outlined in Case "B" it is going to show a small profit, which may or may not be enough to give a fair return to the investors and provide any extra compensation for the working crews to bring the average labor rate above the $1.00 per hour average assumed. Case "C" provides a margin of profit that should give a fair return to the investors and allow a generous wage increase to labor above the assumed average.

We have shown the results that may be expected when management shows the proper interest. Now, let us see how labor's attitude can affect the picture.

In Case "A" the labor situation is usually the development of many years operation and is fairly stable. However, when new methods and equipment are introduced, very often there is opposition to any reduction of working crew numbers, even though tasks are easier and more efficiently done. Case "A" takes 25 men, Case "B" 18 men and Case "C" 17 men.

If labor says "no reduction" for Cases "B" and "C" and insists on keeping the same 25 men as originally used on the payroll, we add to producing costs as shown in Table B. Case "B" drops right down to the point where the return to investors is at a bare minimum. This eliminates any opportunity to build a reserve for bad years, and the opportunity for considering anything to bring the labor rate above the $1.00 average. Case "C" still draws a fair return on the capital investment, a chance to accumulate a reserve, and reason to give serious consideration to raising the average wage level. However, not every lime producer is in a position to make an investment of a half a million dollars in new equipment, but could invest $125,000 over existing facilities to make possible the situation of Case "B," even to the extent of remodeling more than 5 kilns.

It may be argued that if the selling price is not adequate to show a reasonable profit, it should be raised. In the competitive American market, existence is based on efficiently operated producing units and the necessity for raising prices indicates one or both of two things, inefficient management, or inefficient labor. The inefficiency can take any one of several different forms and will eventually result in the economic death of all parties connected with it. On the other hand, efficient labor and efficient management working together, can make a product that will sell competitively in the open market at a fair price, show a fair profit, give a fair return to the investors, and pay a fair wage to the workmen.

Lime Kiln Installations

ELECTRO METALLURGICAL CO., has announced plans to build three lime kilns, including screening and storage facilities, in Ashtabula, Ohio, to supply lime requirements for the company's calcium carbide furnaces.

Transfers Offices

KEYSTONE Sand and Gravel Division, Dravo Corp., has transferred its city offices from the Dravo Building, 300 Penn Avenue, to the former Pitt Bank Building, Fifth and Liberty Avenues, the corporation has announced. The new office building has been re-named Dravo Building.

Cover Picture

FEATURED on the cover of this issue is an illustration of the Henry J. Kaiser Co., plant at Pleasanton, Calif. A Caterpillar Diesel D8 tractor is shown "dozing" material down into a receiving hopper. This plant ships an average of 160 carloads of washed sand and gravel per day.

TEN YEARS without a Lost-Time Accident

National Gypsum Co., Celebrates No-Accident Record of National City, Michigan Quarry

By BROR NORDBERG

TEN years of operation without a single lost-time accident was the record set by the gypsum quarry of National Gypsum Co., at National City, Mich. On August 1, 1948, this operation entered its eleventh consecutive year unmarked by accident. There are only eight quarries in the United States that have operated for ten years and more than 300,000 man-hours without a lost-time accident. A fitting celebration was held by the company on August 5 at the Holland Hotel, East Tawas, Mich., attended by Melvin H. Baker, president, L. R. Sanderson, vice-president in charge of operations, M.C.M. Pollard, director of safety for all plants of the company, and C. Dunn, editor of *National Gypsum News*, all from the Buffalo, N. Y., headquarters; James D. Kerr, plant manager, C. L. McKenzie, safety director, Luther Jones, quarry superintendent, and other supervisory personnel at National City. All employes of the quarry were present and given appropriate recognition at the dinner.

J. D. Kerr, plant manager, awarding citation certificates

Some idea of the problems in developing and working quarry are evident in this view

Invited guests present from the outside were C. L. Jones, safety director, Michigan Limestone and Chemical Co., Rogers City, Mich., whose quarry holds the all-time safety record and the editor of ROCK PRODUCTS.

During the ten year period starting August 1, 1938, 1,348,663 tons of gypsum rock were drilled, blasted and hauled to the processing plant. There were 2,340,118 cu. yd. of overburden moved and 483,245 man-hours worked. The most serious accident (if we may call it that) during the ten years was the dropping of a jackhammer on a worker's toe, which is comparable to the ordinary household mishap. According to the quarry superintendent, there was not a single close call to a serious accident through the ten years and for eight of the years there wasn't a single doctor's case.

Operating Conditions Difficult

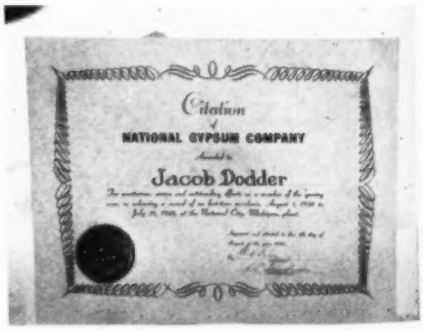
The quarry operation at National City is not among the largest to be sure but the nature of the excavation and the conditions under which operations have had to be conducted the past ten years have certainly made this record remarkable.

Two quarries have been opened since Aug. 1, 1938, including the present site of the workings which has been under development since January of this year. Prior to 1940, locomotives hauled the rock in cars over narrow gauge rail to the gypsum plant. Then came the conversion to truck haul. During much of the time, under good conditions, the trucks have averaged 25 trips in 8 hr. Average haulage distance has been two miles round trip.

For most of the ten year period, thickness of rock has averaged some 14 ft. and all of it has been covered with substantial overburden. The new quarry involves stripping up to 50-ft. of overburden to uncover about five ft. of stone.

Equipment consists principally of three Gardner-Denver derrick drills, two jack hammers, a 1¾-cu. yd. Diesel-powered Lorain shovel, a 1¾-cu. yd. Diesel-powered Marion shovel, a 2¾-cu. yd. Marion electric, eight trucks with Thornton tandem 4-wheel drives and Easton side-dump bodies which transport eight tons to the load. Stripping is now done under contract and involves the removal of much heavy gumbo. A Euclid loader and seven 14-cu. yd. Euclid semi-trailers are engaged in removal of it. Until the new quarry was opened, stripping was done by the quarry crew.

Demand for gypsum products had been extremely heavy for war construction purposes and was continued at a high level thus far throughout



Citations like this were presented each quarry worker, reading, "For meritorious service and outstanding efforts as a member of the quarry crew in achieving a record of no lost-time accidents, August 1, 1938 to July 31, 1948, at the National City, Mich., plant."

Vice-president L. R. Sanderson compliments the quarry workers for their outstanding safety record

the postwar period, so quarry operations have been at a high rate for much of the period during which the safety record was established. Two shift operation has been the rule, from 7 a.m. to 3:30 p.m. and from 3:30 p.m. until midnight. No drilling is done at night but stone is loaded and hauled at night. Peak working force is 33 men. Operations have proceeded throughout all seasons in spite of northern Michigan's extremely severe winters, with slippery roads and mud to contend with much of the time. Nevertheless, not a single man in the quarry today has ever had a single lost time accident in his work.

Dinner Party

Over 50 men attended the company-sponsored dinner which featured brief addresses by plant manager James D. Kerr, Safety director M. C. M. Pollard, vice-president L. R. Sanderson, C. L. Jones of Rogers City and concluded with an inspiring talk by president Melvin C. Baker. Plant safety director C. L. McKenzie was toastmaster.

All the speakers expressed their appreciation to the quarry workers for their fine record and emphasized the important part that proper attitude toward their work plays in making conditions safe for workers.

Mr. Baker was highly complimentary in his praise for the fine safety record and presented a talk on the company and its policies that was highly informative. He mentioned the important role of gypsum products to emphasize that here is a basic industry with a vital part in the building industry, and he outlined the growth of the company from its beginning as an example of how expansion under a capitalistic system creates job opportunities.

National Gypsum Co. built its first plant at Clarence Center and, in 1926, built the National City mill. From this small beginning, said Mr. Baker, the company has expanded to the point where it now owns and operates 24 plants. The company has $60,000,000 in assets and now employs 6000 men, which growth in employment, he pointed out, provides proportionate opportunities for workers desiring advancement.

President Baker addressing the dinner guests.

In speaking of postwar expansion, he said that expenditures of $18,000,000 were originally planned. Actual outlay grew to $33,000,000 and included the new gypsum plant at Baltimore, Md., the new lime plant at Kimballton, Va., new mineral wool plants at Alexandria, Ind., and Dover, N. J., and extensive rehabilitation at other plants. He cited the company's record in war production from the $25,000,000 Blue Bonnet Ordnance plant operated in Texas.

Production from the company's plants, he said, is now sufficient for the ceilings and walls of 250,000 homes a year which is one-quarter of the national goal of a million homes.

Mr. Baker emphasized that the workers are partners in the business whose cooperation is necessary to accomplishments such as he had outlined. He particularly complimented Luther Jones who has been quarry superintendent for 21 years and, in reminiscing, told of failures experienced in opening a quarry at National City which were not overcome until Mr. Jones came with the company.

President Melvin H. Baker chatting with workers at conclusion of dinner

C. L. Jones, safety director, Michigan Limestone & Chemical Co., commenting on safe operations. To the right may be seen Luther Jones, quarry superintendent and President Baker

Mr. Jones was asked to say a few words. He thanked the men for their fine attitude and cooperation and gave them the credit for the unbroken safety record. He was confident that the quarry could continue to be accident-free much longer. The dinner concluded with presentation of individual citation certificates by Mr. Kerr to each worker. Many stayed around to get acquainted with officers of the company.

A visit to the quarry and a brief interview with Luther Jones brought out some of the reasons why there have been no lost-time accidents for over ten years. It was soon obvious that the workers had high morale and a cooperative attitude that go hand in hand with safe operation. Much of the credit is due Mr. Jones and plant management, reflecting all the way to the top.

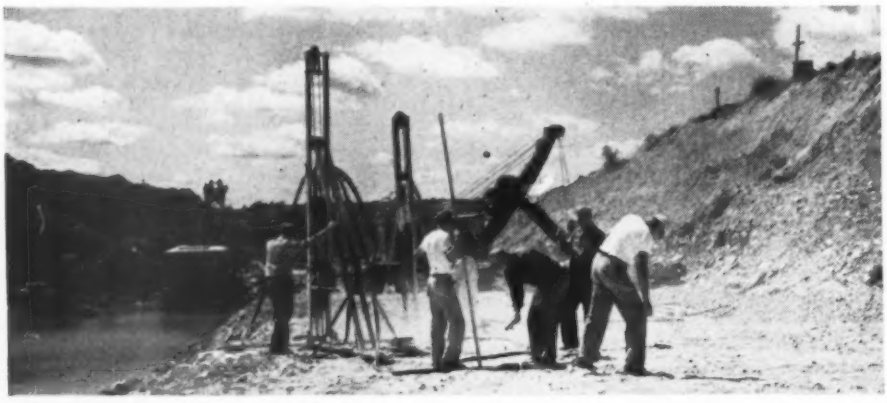
The last serious accident was on Feb. 21, 1937, when a car tipped over and dumped three tons of rock on a worker. Some 17 months of time were lost as a result of the accident. The

Three safety men compare notes. Left to right: C. L. Jones, safety director, Michigan Limestone & Chemical Co.; M. C. M. Pollard, director of safety, National Gypsum Co.; and C. L. McKenzie, safety director, National City plant

Luther Jones, quarry superintendent (center) was induced to comment on working practices in his quarry office. On left is C. L. McKenzie, plant safety director, and on right is M. C. M. Pollard, safety director of the company

company immediately replaced the obsolete cars which contributed to the accident. It was this accident that prompted Mr. Jones and other key quarry workers to get together and discuss ways and means to eliminate accidents. Only one has occurred since and that was questionable. A worker supposedly sprained his ankle in stepping from a power shovel on August 1, 1938.

According to Mr. Jones, the secret in preventing accidents has largely been through cooperation, individual worker's knowledge of how to do their jobs right and a desire of the workers to help each other to avoid accidents. New men are told the policies that govern, in the presence of the entire crew and are encouraged to feel free to ask other workers how to do their jobs the best and safest way. If hazards are reported, they are corrected immediately. Very few hazards ever get as far as the plant safety committee, and, said Mr. Jones, the company has always given whatever was necessary to correct hazards as reported. In this quarry, the workmen are actually on the lookout for hazards. Good mechanics keep the equipment in safe condition.



Left to right: Frank Goodman, drill operator; Edward Haglund, blaster helper; William Hill, drill helper; Wilbert Crum, drill operator; and Edgar Jones, blaster. Stripping is proceeding in background

Continuously-moving loader excavating and filling trucks in removal of heavy overburden

President Melvin H. Baker congratulates Luther Jones, quarry superintendent

If a particularly hazardous job is confronted, procedure is to discuss the safest way to accomplish that job and follow through. Workers are kept informed why things are done in certain ways and are instructed not to rush but instead to do a job correctly in a safe way. Several men are trained to operate each piece of equipment so that there never is a time when inexperienced men need be called upon to operate equipment. Meetings to discuss safety are held on company time in the quarry office. The occurrence of minor accidents is discussed in these meetings, and solutions determined to prevent recurrence.

Gypsum Production

THE NEW SUPPLY of crude gypsum in the United States in the first quarter of 1948 was 3 per cent greater than in the corresponding period of 1947, Bureau of Mines reports. The increase in domestic production of crude gypsum was less than 1 per cent, but tonnage imported increased to 29 per cent, compared with the first quarter of 1947. Output of calcining plants was 19 per cent greater.

Opens New Stone Quarry

J. & L. SNOUFFER, INC., has announced completion of a new stone quarry near Dublin, Ohio. Portable Cedar Rapids crushers and auxiliary equipment are being used. The company produces agricultural limestone and crushed stone for streets and driveways. L. J. Horch is general manager of the firm, and R. L. Snouffer is secretary.

Mines Phosphate

PRINCE MINING CO., Mt. Pleasant, Tenn., is mining phosphate in Giles County at the rate of six to eight carloads weekly, reportedly being shipped to the Victor Chemical Works at Mt. Pleasant.

LATIN AMERICA'S Expanding Cement Industry

Part 2: Concluding article deals with modern design elements

By JOS. M. WOLFF*

SOME of the modern design elements which will be considered for future Latin American cement plants are included in the following tabulation. Their adoption will depend on local conditions, cement specifications and commercial demand related to types and quality of cements:

1. Centralized storage building or area for raw materials, gypsum, coal and clinker.
2. Belt conveyor transport systems incorporating high degree of mechanization and flexibility.
3. Overhead traveling bucket crane for materials handling.
4. Pneumatic transport systems for dry pulverized materials.
5. Closed-circuit raw grinding.
6. Closed-circuit clinker grinding.
7. Long rotary kiln and heat recuperating devices.
8. Air-quenching shaking grate type clinker coolers.
9. Combustion controls and related kiln instrumentation.

Some basic cement plant design conditions, as they exist in several Latin American countries, are discussed in the following sections with relation to the influence they have exerted on existing plants, and their probable effects in determining the location, arrangement of machinery and refinements in operation that will be adopted in the near future.

*Engineer, Pyro-Processing Section, Allis-Chalmers Mfg. Co.

Fuel and Power Source

Coal is employed as fuel for cement rotary kilns in only three countries in Latin America. These are Brazil, Chile and Colombia, all of which have coal mines within the country. In Brazil and Colombia, fuel oil is used in some plants which are located on the coast at points where ocean going tankers can deliver oil shipped from Peru and Venezuela. Fuel oil reaches the cement plant in Bolivia via railway from Mollendo, Peru or Arica, Chile and the cost placed at the plant runs from 40 to 50 dollars (U.S.) per metric ton, about 40 per cent of which is represented by inland freight.

In other countries, fuel oil cost will vary from 15 to 30 dollars per metric ton, at which price maximum thermal efficiency in the kiln to reduce fuel consumption becomes essential or, at least highly desirable. The element of cost of fuel in burning a barrel of cement clinker becomes very important and will approximate $0.70 (U.S.) per barrel based on using Bunker "C" fuel oil at $24.00 (U.S.) per metric ton and an assumed fuel rate of 17 percent.

Accordingly with rising fuel costs in Latin America, the trend is toward the adoption of internal heat recuperating apparatus, air-quenching, shaking-grate type coolers, instruments and related auxiliaries in conjunction with long kilns in both the wet and dry processes. In order to maintain optimum and efficient conditions in the kiln, automatic controls and recording instruments are used. These are centralized in a master control board, such as illustrated in Fig. 6, located on the burning floor.

The employment of extremely long kilns, Fig. 7, has had a strong effect on plant layout. The "straight line" and "parallel" arrangements are losing favor and have been superseded by the "T" or "H" designs which have advantages related to efficient materials routing and handling.

Electric power supply is an important problem in projects involving new cement plants. Large sources of power for industrial use are not yet available except in the vicinity of large cities. High voltage transmission lines have not been extended to remote areas to form a widespread, interconnected power system.

Where fairly skilled mechanics are obtainable for the exacting task of maintenance and repair, and water is plentiful, independently oil- or coal-fired boilers and steam turbines are preferred. There are two or three waste-heat power stations in Latin America which operate in conjunction with wet process kilns. Future installations of this type are unlikely on account of high capital cost and the improvements made in utilizing heat in rotary kilns. A long kiln equipped with heat-recuperating devices such as a chain system (Fig. 8) and air-quenching clinker cooler (Fig. 9) may show better heat extraction than can be obtained from a waste-heat installation.

Diesel engine generator units are

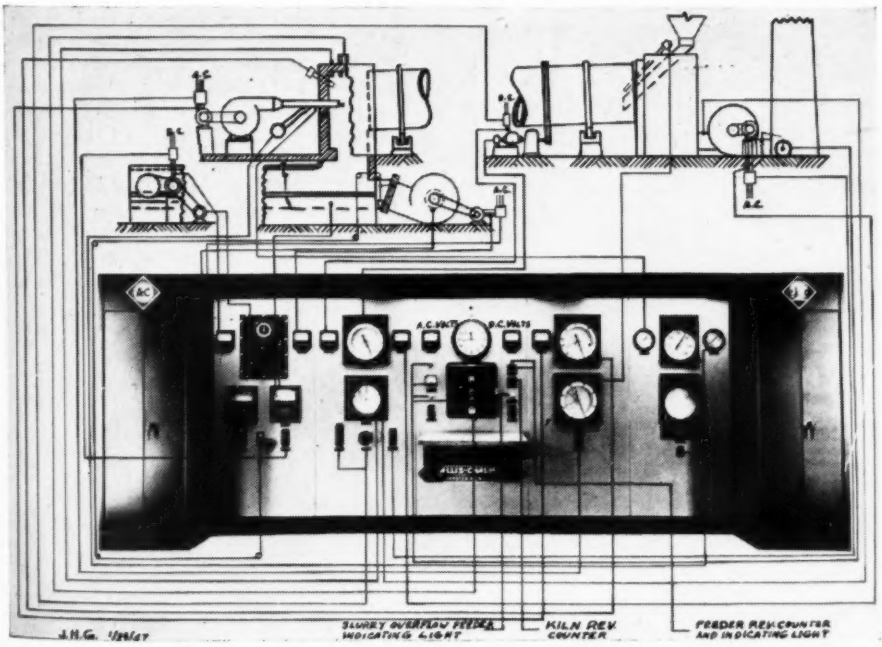


Fig. 6: Master kiln control panel for controlling operation of oil-fired rotary cement kiln, with induced draft, and an air-quenching shaking grate type clinker cooler from which heated secondary combustion air is supplied to the kiln

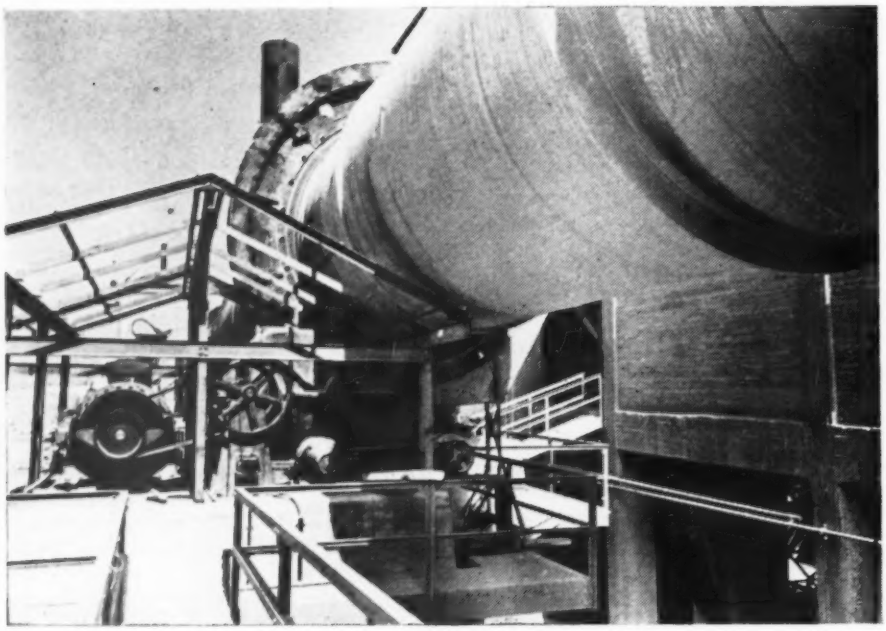


Fig. 7: Installation view of a 9 ft. 6 in. by 11 ft., by 9 ft. 6 in. and 300-ft. long dry process rotary cement kiln. The long path through the kiln promotes recuperation of heat from the gases of combustion

generally installed as part of cement plants in remote and arid regions. These units operate at high thermal efficiency, possess a high order of dependability, and do not require expert crews to service them properly in isolated areas. The generating facilities of such isolated cement plants will furnish power for the employee's housing development and sometimes excess power is sold to nearby towns which do not have any other source of electric power.

Hydro-electric plants in Chile are the predominant source of power in that country. Several new hydro-electric power plants are presently under construction under Chile's program for electrification of railways and increasing industrialization. One cement plant in Chile and two in Mexico control their sources of hydro-electric power through direct ownership or subsidiary companies. Hydro-electric power is also well developed in Colombia and a number of cement companies there have built their own generating stations. Water power is also utilized to some extent in Brazil but steam turbines furnish the bulk of power in cement plants there.

Markets, Specifications and Competition

Important programs are already in process of execution to improve highway and railway communications between various Latin American countries. These will go forward concurrently with increased industrial and residential construction. It is expected that cement plants in most countries will experience no difficulty in disposing of their products for several years more, especially if they are located near power and irrigation projects. New plants or extensions are being built for almost all Latin American countries. It is quite possible that some countries may have a small reserve capacity after several new projects are completed. But many efficient individual producers whose cements have attained acceptance will not fulfill demand without further expansion.

In nearly all Latin American countries the supply is still fairly short, and will be met only by further installation of new equipment or importation from European sources, for example. The latter source of supply is doubtful since the scarcity of cement is world-wide, although Belgium and Poland have shipped cement to Latin America recently.

As the present boom subsides, cement producers and executives realize that a buyers' market will slowly develop. Under this condition competition will dictate the production of better cements, and farsighted operators are planning ahead with this in mind. They are acquiring new plants to replace obsolete ones, adopting modern processing methods, and intensively modifying their existing plant facilities accordingly.

It is interesting to note how an exterior market for cement may develop between certain Latin American countries, depending on circumstances. During 1943 and 1944 there arose an acute shortage of cement in Bolivia owing to unprecedented demand by the tin and tungsten mines. The limited capacity of the sole plant in the country, then rated about 12,000 bbls. per month, could not meet the demand. Tin and tungsten mines in Bolivia were then expanding surface and underground facilities at an unprecedented rate and those activities required enormous quantities of cement. Also, construction of roads and some industrial buildings was proceeding at the same time.

The deficiency of cement at that time was met by some shipments from the United States and Peru, but largely by delivery of Argentine cement from a 200-ton dry process plant that had been built in 1938 in the Province of Salta. As this cement had to bear heavy inland freight charges over the international railway between Argentina and Bolivia, the resultant price per barrel in Bolivia was about $7.00 (U.S.). This was double the cost of the domestic cement. Imports of cement were terminated in 1944 by a decree of the Argentine government which prohibited shipments of cement abroad on account of serious shortage of fuel oil that developed due to inadequate deliveries from abroad.

Argentine cement plant operators, with characteristic energy and resourcefulness, overcame the wartime problems created by lack of fuel oil by burning producer gas and spent vegetable oil seed. However, the restrictions against cement shipments abroad were not lifted. Meanwhile, domestic consumption in Argentina had experienced a revival, as the national economy was stimulated by industrial construction. It is interesting to note that Argentine cement has

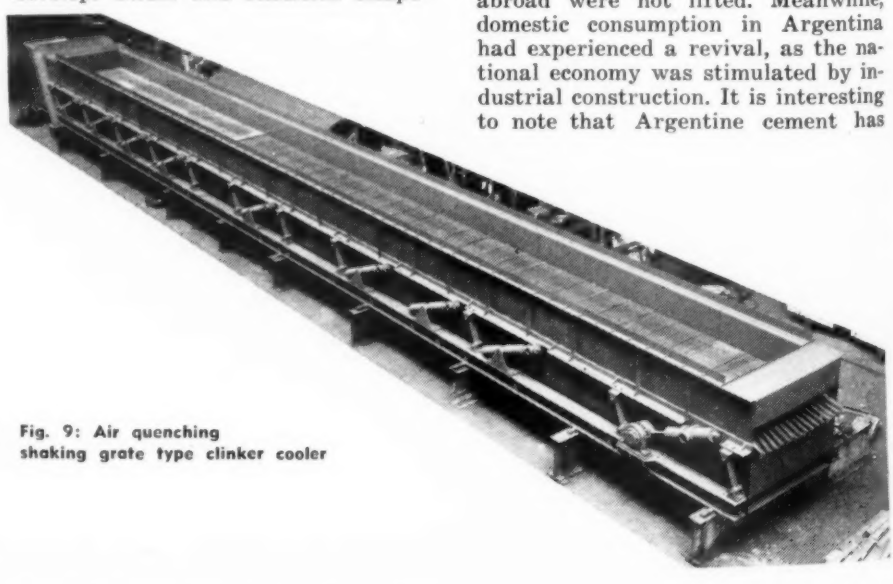


Fig. 9: Air quenching shaking grate type clinker cooler

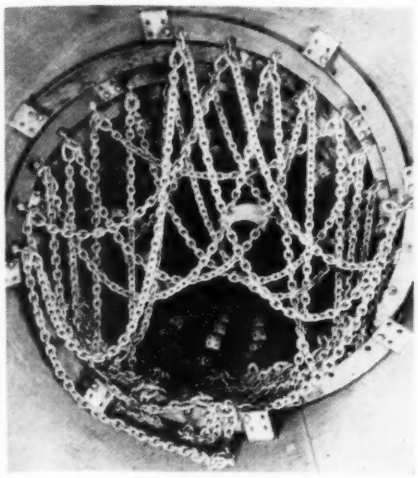


Fig. 8: Patented chain system in a wet-process rotary kiln

been shipped on several occasions to Chile to meet that country's commercial requirements; also, to alleviate an urgent situation resulting from an earthquake as in 1939 when great damage to several cities south of Santiago was wrought. Serious competition for Latin American cement plants, from Belgian, German, Danish, and English sources as existed some ten years ago, is not likely to reappear for sometime if at all. Most countries are becoming self sufficient as already noted and they will discourage the entry of foreign cement by tariffs. High quality white cements will probably continue to be imported from the United States in small quantities for special uses.

Labor and Mechanization

As mentioned in Part I of this article, it is unlikely that any new cement plants or extensions destined for Latin American countries will be rated smaller than 200 metric tons, or 1200 bbls. daily. In a plant of this rating, mechanization of materials handling is necessary, as labor cost for handling the quantities of materials involved would be excessive in almost all countries.

Rapid growth of industrial plants in many countries created a shortage of workers, and consequently higher rates of pay. The percentage of labor in total mill cost has increased considerably, although fuel and electric power are still the major items of expense in producing a barrel of cement.

Accordingly, more intensive mechanization will be practiced. Since in small plants the cost of mechanization is disproportionately high and hand labor expensive, fairly large cement plant units with special emphasis on more efficient burning and grinding may be foreseen in the future. This trend wil be sustained by the fact that further visible industrial growth assures correspondingly large markets.

Raw Materials and Climate

As in the United States, practically all Latin American cement plants use massive limestone or cement rock, the physical condition of which necessitates crushing in a gyratory or jaw crusher and/or a hammermill. The writer does not know of an instance of the use in those countries of marl or oyster shells as calcareous material.

Shales of varying degree of consolidation as used also require crushing or disintegration prior to grinding. Wash mills for digesting wet clays or muds are most prevalent in Brazil and Uruguay.

The natural state in which each raw component occurs influences the choice of process and, in some instances, dictates the adoption of the raw materials treatment process. In arid regions such as central and northern Chile, northern Argentina, the coasts of Peru and Ecuador, the dry process prevails. Certain plants, particularly the one in Ecuador, are obliged to observe special practices such as accumulating large storage of raw materials during the seasons of intense rain in order to carry on the dry process.

Mexican cement plants, with one exception, practice the dry method, although the raw materials require drying in every instance. A strong inclination is developing toward the wet process as a means of attaining improved quality cements and producing diversified types. One new plant of about 700 metric tons has been designed for open circuit wet raw grinding.

All plants in Colombia have the wet process, a situation which is attributed to the wet raw materials and heavy rainfall, and to the very humid climate. In Venezuela, a similar condition exists on the coast but inland there is one 50-ton dry process plant.

Brazil and Argentina have wet process plants in the majority. Moisture contained in the raw materials as well as rainfall forces the use of the wet method in most localities in these countries.

This trend is justified by a much lower expenditure of electrical energy. Where power cost is high this is an important element in reducing cost of production. More wet closed circuit grinding is probable within the next few years, as more finely ground, more uniform and chemically precise raw mixtures become necessary to produce cement of higher quality and uniformity. A modern 9- x 13-ft. grinding mill that has been applied successfully to wet grinding in conjunction with mechanical classifiers is shown in Fig. 10. This mill is also being utilized as a preliminator and finish mill in conjunction with air separators for clinker grinding.

Generally speaking, grinding practice in South American cement mills in both raw- and clinker-grinding departments, has not reached a stage where mechanical classifiers or air-separators are essential but application of these auxiliaries are increasing. There is a growing realization that new plant design should be projected into the future when it is almost a certainty that there will be intensified competition as well as more varied and rigid users' specifications. This will oblige cement producers to grind their standard cements to above 1400 square centimeters per gram (91% minus 200-mesh) as an average at present.

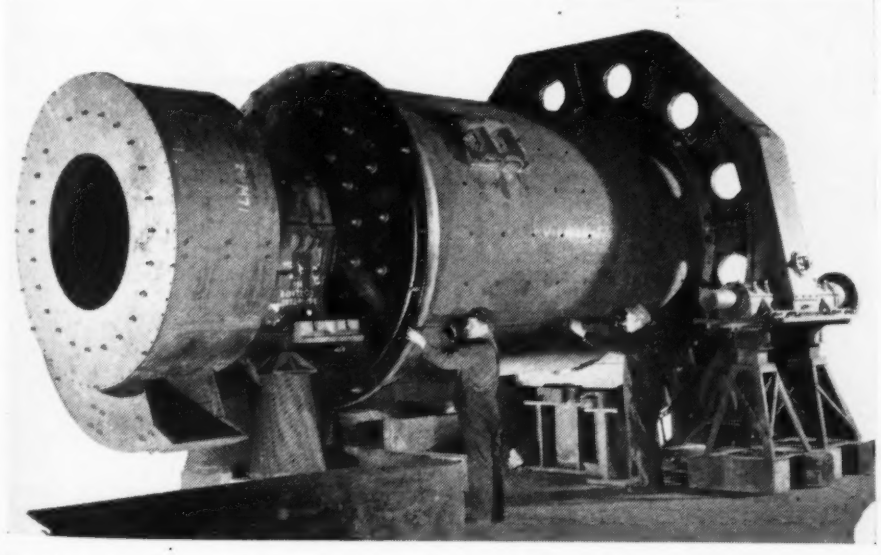


Fig. 10: Feed end view of a 9-x 13-ft. intermediate level ball mill with scoop feeder. Mills of this type and size are used for wet closed-circuit grinding of raw materials from minus ¾-in. to 90-92 percent minus 200-mesh

Produce Crushed Rock

WACO TEX MATERIALS CO., Eastland, Texas, has leased over 1000 acres of land in the area to furnish crushed rock for construction of a large dam near Whitney on the Brazos River watershed.

Airplane view showing concrete and steel water tank, clinker and gypsum storage, to the right, dryer and mill building, center, and to the left, finished cement silos and packhouse. Substation and office building may be seen on the left, foreground

Method of Manufacturing BLAST FURNACE SLAG CEMENT

Modern plant of Cementos Del Norte, Monterrey, N. L., Mexico, manufacturing "Atlante-Ferroportland" cement using clinker from adjacent cement mill

EARLY in 1947, Cementos Del Norte, S. A., started production of portland blast-furnace slag cement in Monterrey, N. L., Mexico, about 150 miles south of the U. S.-Mexican border. Monterrey is the largest industrial city of Mexico, containing many factories, including a steel works having basic blast-furnace slag as a waste material. Here is also located the cement mill of Cementos Mexicanos, S. A. These two establishments financed and built the plant of Cementos Del Norte for the purpose of making an economical, but good quality hydraulic cement by grinding together basic blast-furnace slag from the steel smelter and portland cement clinker from the mill of Cementos Mexicanos. This cement compares favorably with normal portland cement in many of its properties and sells at the same price on the local market under its trade name of "Atlante." "Ferroportland" is also marked on the cement packages; probably indicating that it is similar to the German "Isen Portland" cement, which is also a portland blast-furnace slag cement.

This plant also manufactures a slag-lime cement called "Siderugico," but as this kind of cement is not of the same high quality as a portland blast-furnace slag cement, only the method of manufacture and properties of Atlante will be described.

Molten blast-furnace slag, consisting of the silicates and aluminosilicates of calcium, from the steel smelter falls into a flowing stream of water. This sudden quenching transforms the slag into a porous sand, commonly referred to as granulated slag, light gray to yellowish in color; its physical state being non-crystalline, glassy or vitrified. In this state slag is a more reactive cementing material than crystalline slag which has formed from molten slag while being slowly cooled.

The granulated slag is transported by standard-gage, drop-bottom, gondola railroad cars from the smelter to the slag storage bin, of about 1000-metric tons capacity, at the cement plant. As received, the slag contains 20 per cent to 40 per cent water; much of which slowly drains from the slag while in the storage bin, collects in drains in the tunnels below, and is pumped away.

A.S.T.M. Type II clinker is supplied by the adjacent plant of Cementos Mexicanos, S. A., and is transported this short distance and delivered to clinker storage by means of a narrow-gage railroad, using side-discharge cars.

A series of table feeders bring the damp granulated slag from the storage bin to either one of two 24 in. conveyor belts, 100 ft. centers, delivering to a cross-belt conveyor, and then to a bucket elevator which delivers the slag to a dryer.

The rate at which slag is drawn from storage and delivered to the dryer is controlled from the dryer by means of a variable speed drive on reclaiming belts and adjustments on the table feeders.

General view of plant, showing silos and packhouse. Note reinforced concrete construction throughout and curved concrete roof slabs and shelters

VIEWS OF BLAST-FURNACE SLAG CEMENT PLANT

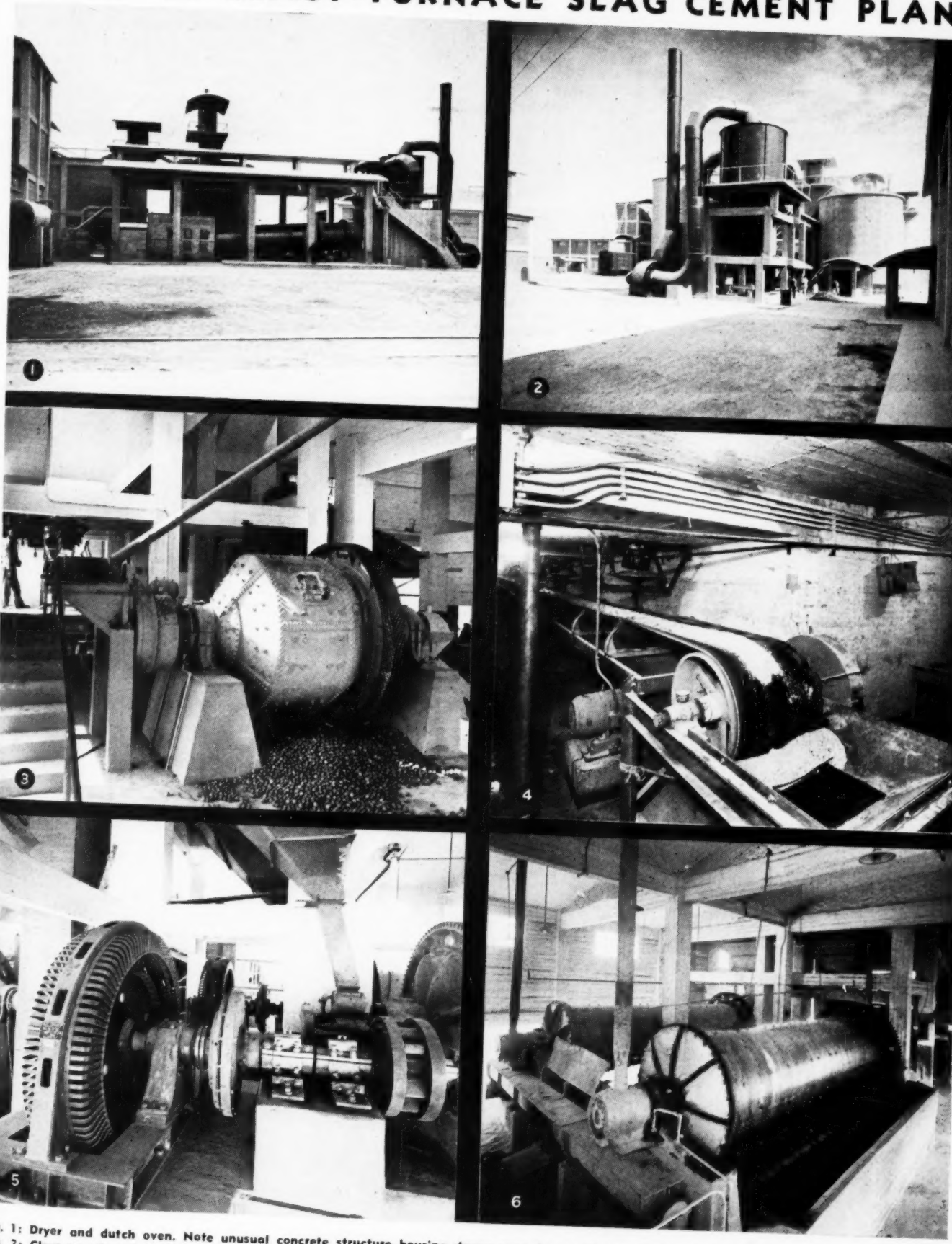
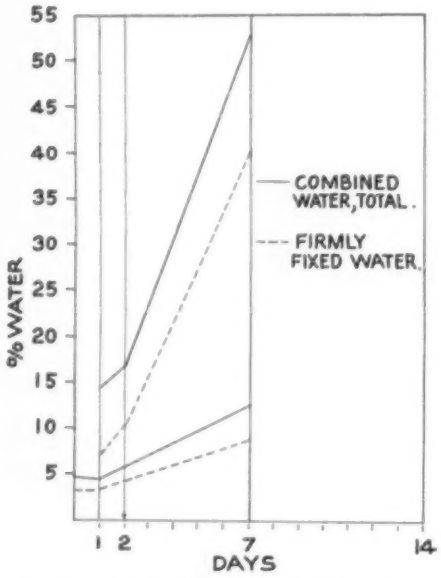


Fig. 1: Dryer and dutch oven. Note unusual concrete structure housing dryer; open for ventilation at the sides but covered against the elements. Fig. 2: Close-up of cyclone for recovery of stack dust and screw conveyor for its return to the system. Fig. 3: Conical ball mill for preliminary grinding, preceding tube mills. Fig. 4: Slag table feeders and reclaiming belt. Fig. 5: Synchronous motor and drive for tube mills. Fig. 6: Tube mills with water spray to keep down temperature



Water combination capacity of blast furnace slag. (From L. Forsen on Retarders and Accelerators, p. 320, Symposium on the Chemistry of Cements)

Slag is dried in an 8- x 50-ft. Vulcan double-shelled rotary dryer, having an inclination of 1¾ in. per ft., riding on two sets of trunnion rolls using floating tires. From the dryer, the slag is elevated to the dried slag storage bin.

To dry the slag to 1 per cent moisture, or less, about 40 cu. m. of gas per metric ton of slag is required. The temperature of the slag while drying is not allowed to get too high, since this will cause the slag to become crystalline with poor hydraulic properties. A large cyclone dust collector removes dust from the dryer exhaust gases and returns this to the system.

Proportioning and Grinding

Portland cement clinker, dried slag and gypsum are proportioned by weight by three Hardinge Feedometers onto a common belt which delivers these materials directly to a preliminary grind mill: This is a 4- x 8-ft. Hardinge conical ball mill, powered by a 200-hp. motor. The mill is charged with about 20,000 lb. of 2-in. steel balls. In closed-circuit with this preliminary mill is a 5- x 8-ft. Tyler Hum-mer vibrating screen with 14-mesh cloth. The rejects from the screen are returned to the Hardinge mill and the fines go to the secondary grinding mills, via surge bins.

The secondary grinding is done by two 6- x 22-ft. Gates tube mills, powered by 250-hp. Allis-Chalmers synchronous motors, connected to the mill with a magnetic clutch. Each mill is loaded with 44,000 lbs. of ⅞ in. steel balls, and the grinding capacity of each tube mill is about 7 t.p.h. at 1900 cm/gr. surface area.

The mills are sprayed with water to prevent the temperature of the cement being ground from rising high enough to cause false set.

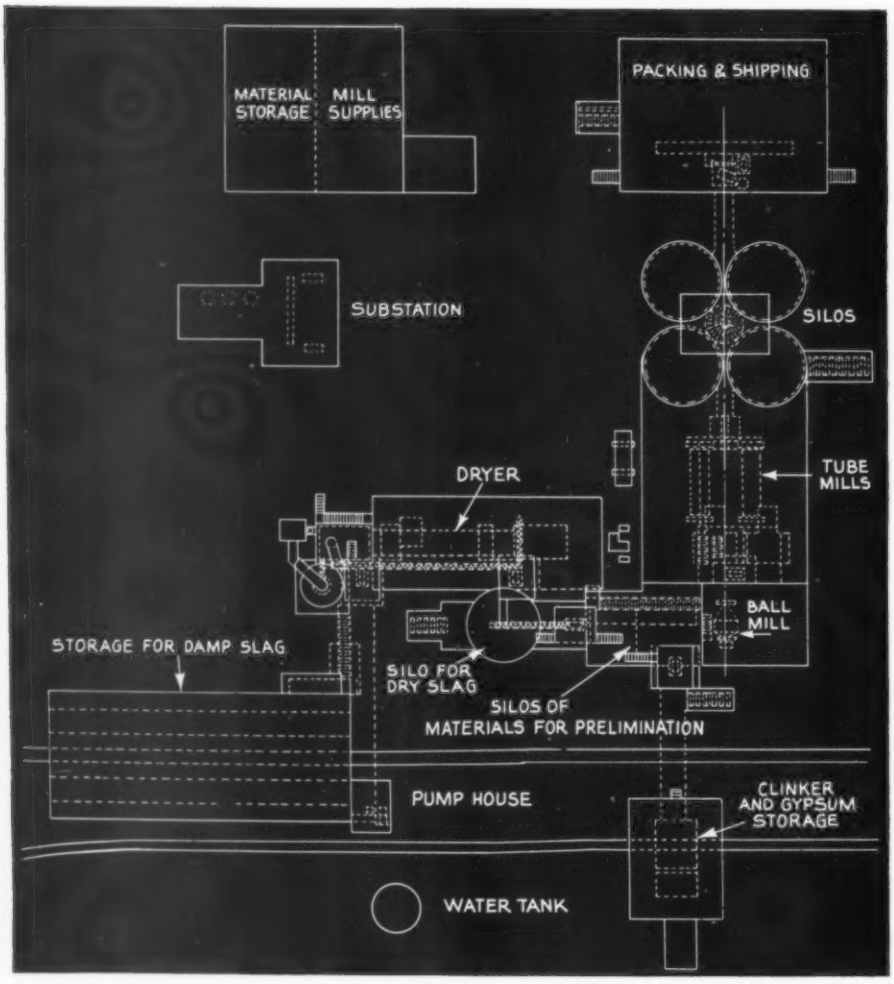
By means of a right-hand and left-hand screw conveyor, the discharge from both Gates mills is delivered to a common vibrating screen in order to remove oversize metal. Then it goes to a Fuller-Kinyon pump which conveys the cement to any one of four cement silos, each having a capacity of about 1000-metric tons. Three of the cement silos are used to store "Atlante" and the ferroportland cement, and the fourth silo stores "Siderugico" slag cement.

A portable Fuller-Kinyon pump delivers the cement from storage to a surge bin above the three-tube St. Regis packer. From the packer a belt conveyor transports the sacks of cement to the railroad box car doors. Shipment of product is almost entirely by rail; there is no bulk shipment. The cement is packed in four-ply paper bags having a net weight of 50-kilos (110 lbs.) or 20 sacks make one metric ton (2240 lbs.).

Locally, either portland cement or Atlante, portland blast-furnace slag cement or ferroportland, sells for the same price, 100 pesos per metric ton (about $4.05 per U. S. bbl. of 376 lb.). Siderugico, the slag-lime cement, sells for 60 pesos per metric ton. This latter is a true "cold process" slag cement made at the plant of Cementos Del Norte by grinding together approximately 90 per cent slag and 10 per cent hydrated lime and a small amount of gypsum. It is used for sidewalks, foundations and for stucco. It is very suitable for stuccos and plasters as its color is almost white. Its strength in physical tests is about two-thirds that of Atlante.

Electricity is supplied by an Industrial Cooperative Group. Power for plant operations is received at a high voltage and stepped down to 440-volts by a bank of transformers. The plant is well built with modern equipment, roomy and clean.

Jesus Barrera is president of Cementos Del Norte, S. A. Edgardo G. Quiroga is director, and John C. Seelig is consulting engineer. These gentlemen were all very helpful and cooperative in supplying the writer with information, samples of cement and slag, and pictures of the plant.



Plan details of Cementos Del Norte, S. A. plant which is producing blast-furnace slag cement at Monterrey, N. L., Mexico

Cost of Manufacturing Portland Blast-Furnace Slag Cement

In making portland blast-furnace cement, the principal items of cost are the portland cement clinker itself, which is usually less than 50 per cent of the weight of the cement, and the

cost of the power to grind the mixture of clinker and slag to cement fineness: The writer calculated that it required about 6.2 k.w. of power at Monterrey to grind the Atlante to about 1900 cm/gr, Wagner surface area, which is about the same power range as required to grind portland cement from substantially all clinker.

Granulated blast-furnace slag, at the smelters, is usually very cheap: The Bureau of Mines reports a value of from 10¢ to 26¢ per ton during the years 1938 to 1945. Transporting the slag from smelter to cement factory, would of course, increase its cost. In addition not all slags are suitable for making hydraulic cements.

The strength tests of Atlante, portland blast-furnace slag cement, in sand mortars compares well with a Normal or Type I cement, but the concrete strengths are lower, even at 28 days. However, the specific surface is rather low; raising this should increase the strengths of both concrete and mortars. High-strength portland blast-furnace slag cements are made in Europe, probably mainly, by fine grinding.

The volume changes of this cement appear to be no better than the average portland. Perhaps this will show up better at longer periods: The reports of durability of this type of cement are generally good.

Cements Containing Blast-Furnace Slag

The low heat of hydration indicates that portland blast-furnace slag cements would be suitable for mass concrete use.

CHEMICAL ANALYSES OF SLAG, CEMENT AND CLINKER USED IN ATLANTE
(Results in Per Cent)

	Blast-Furnace Slag	P.C. Clinker*	Cement
Insoluble residue	0.60		0.53
Silica	29.44	22.06	25.85
Alumina	19.94	4.86	12.66
Iron oxide	1.30	3.56	3.50
Manganese oxide	n.d.		0.30
Calcium oxide	42.20	65.34	50.85
Calcium sulphide	4.47		2.37
Magnesium oxide	1.95	1.20	1.59
Sulphur trioxide	0.05		1.30
Ignition loss	Gain in weight		Gain in weight
Soda	n.d.		0.22
Potash	n.d.		0.38
Total	99.95		99.55
Free lime	none		0.40

*Analysis of clinker given by Mr. Quiroga.

Much of the iron present in the slag and cement is in a reduced state.

The cement is said to be composed of about 38 per cent Portland cement clinker, 59 per cent slag and 3 per cent gypsum.

STRENGTH TEST RESULTS ON ATLANTE CEMENT
All results in pounds per sq. in.

Age when tested	24 Hours	3 Days	7 Days	28 Days	3 Months
Tension, 1c:3s	123	247	410	488	520
Compression, 1c:2.75s	267	1175	2458	4300	5183
Compression, concrete	326	1023	1521	2466	2954

Composition and properties of wet concrete: Mix, approximately 1:2:4, 5.8 sacks per cu. yd., 6.6 gals. water per sack, 3 inch slump, 151 lb. per cu. ft., good workability, considerable bleeding.

Compression strength on mortar cubes autogenously healed in water after being tested to failure at 3 days: Strength at 28 days 4025 p.s.i.
28 day strength of specimens stored in air: Compression 3700 p.s.i., tension 430 p.s.i.

OTHER PHYSICAL TESTS ON ATLANTE

Normal consistency, 25.5 per cent	Initial set, 5 hr., 5 min.
Minus 200-mesh, 95.3 per cent	Final set, 8 hr., 50 min.
Minus 325-mesh, 84.8 per cent	

Lea & Nurse specific surface, 2800 cm/gr.: Calculated to Wagner units, 1680 cm/gr.
Specific gravity of cement, 2.99; of slag, 2.88.

VOLUME CHANGES—1c:4s, 10-in. bars. Results in percentages.

	3 Days	7 Days	28 Days	3 Months
Atlante, air-drying shrinkage	0.049	0.052	0.053	0.058
Control, P.C. air-drying shrinkage	0.039	0.042	0.044	0.048
Atlante, water storage expans.	0.006	0.007	0.014	0.016
Control, P.C. water storage expansion	0.003	0.005	0.013	0.013
Atlante, in 10 per cent sod. sulphate	0.032	0.036	0.062	0.158

Autoclave volume change of Atlante, minus 0.006 per cent.

HEAT OF HYDRATION OF ATLANTE
(40 per cent water-cement neats)

At 3 days	50.0 calories per gram.*
At 7 days	55.2 calories per gram.
At 28 days	62.4 calories per gram.

*Because of incomplete solution in the calorimeter test, this figure is believed to be too high. The 7 and 28 day hydrated pastes were ground finer and better solution obtained.

There are three groups, or types, of this kind of cement: Group 1: Pulverized mixtures of granulated blast-furnace slag and hydrated lime; or in place of lime, alkalies or sulphates are sometimes used. Some examples are, slag cement, cold-process slag cement, Pozzolan* cement, Collos cement, Steel portland cement, Schlackenzement, Ciments de Laitier and Siderugico cement.

Group 2: Supersulfate Cements: Mixtures of granulated slag, portland cement clinker and gypsum, where the portland cement content is very low and the gypsum content is relatively high: Supersulfate and Sursulfate cements.

Group 3: Cements made by grinding together basic blast-furnace slag and portland cement clinker. Often, as with portland cement, a small amount of gypsum is included in their composition; examples are: portland blast-furnace cement, portland blast-furnace slag cement; the German Isenportland, when the slag content does not exceed 35 per cent, and Hochofen, when the slag content does reach higher percentages. The French Ciment de fer, with a low percentage of slag, and Ciment Metallurgique with about 50 per cent of slag.

Group 1 cements although relatively cheap, have rather poor hydraulic properties and are not very durable in air exposed concrete,[1,2] but they perform satisfactorily in wet places. Group 2 cements are said to be volume constant or non-shrinking and are resistant to chemical attack. They are a comparatively recent product with little available knowledge as to their performance in practice. Group 3, the portland cement clinker-blast-furnace slag cements, which includes the ferroportland "Atlante" are of primary interest. They are relatively economical to manufacture, if both suitable blast-furnace slag and clinker are available, while at early ages their strengths are generally less than that of normal portland, they approach or equal portland cement strengths at 7 days or later.[2,3,4,5,6,7] They have similar air-drying shrinkage and wet-storage expansions as portland cement, but are more resistant to the attack of aggressive solutions, such as sea water,[2] (Atlante cement is in considerable demand in the oil fields near Tampico) carbon dioxide charged waters and alkaline sulphates. Their heat of hydration is also somewhat less than that of normal portland cement.[8,9]

Basic Blast-Furnace Slag as a Cementitious Material

Rapidly cooled, granulated basic blast-furnace slag has an oxide composition similar to that of portland cement, but differing somewhat in the

*The early U. S. slag cements were termed Pozzolanic Cements; A misnomer, as they were not decidedly pozzolanic.

percentage content of each oxide. When activated by certain agents, such as lime, alkalies, sulphates and portland cement, in the presence of water. Its hydration products, water-fixation ability and its combination with the sulphate part of gypsum is similar to portland cement (See Forsen's Graph). The cementing values of quenched slag are greater than one would expect from cement clinker of similar low-lime composition and are greater than from the slag slowly cooled from a molten state, and further increases of cementing value is obtained when the granulated slag is treated with some activating agent or catalytic agent.

There appears to be three possible explanations for this increase of cementing value, or strength: (1) A non-crystalline body has a higher potential energy content than the same body in a crystalline state: This potential energy of latent crystallization may be an activating force to aid hydration. (2) Quenching the molten slag helps to retain dicalcium silicate in an actively hydraulic state. Slow cooling allows the formation of hydraulically inactive gamma dicalcium silicate. (3) A small amount of pozzolanic reaction may occur, as between the low lime silica compounds of the slag and the hydrated lime developed in setting portland cement: However, Feret has shown that a very small amount of lime will activate a slag and produce a cement. Forsen,[3] speaking of the action of water on blast-furnace slags says, "Without retarders silicates and aluminates cause coagulation on the surface of the grains and the reaction is stopped. Retarders such as lime or portland cement (C_3S), or alkali hydroxide, which forms a lime solution from the sulphides of the slag, decrease the solubility of the aluminates, the silicates enter into the solution and are precipitated as lime-rich silicate hydrates, similar to the cement glue."

Bates[10] points out the importance of proper quenching with water: "The higher the temperature of the molten slag, the quicker the quenching and the lower the temperature of the quenching medium, the more desirable will be the properties of the quenched slag. Such quenching tends to give a greater yield of glass which will react in hydration more energetically and favorably than crystalline compounds." Lea and Desch,[2] "Slag which has been water-granulated by suitable methods has suffered such a rapid cooling as to be almost completely glassy. Slag granulated by other means is less suddenly quenched and may have undergone some crystallization. In such granulated slags some of the grains are almost completely glassy, whilst others have developed a distinctly crystalline structure." Microphotographs are given showing this latter condition.

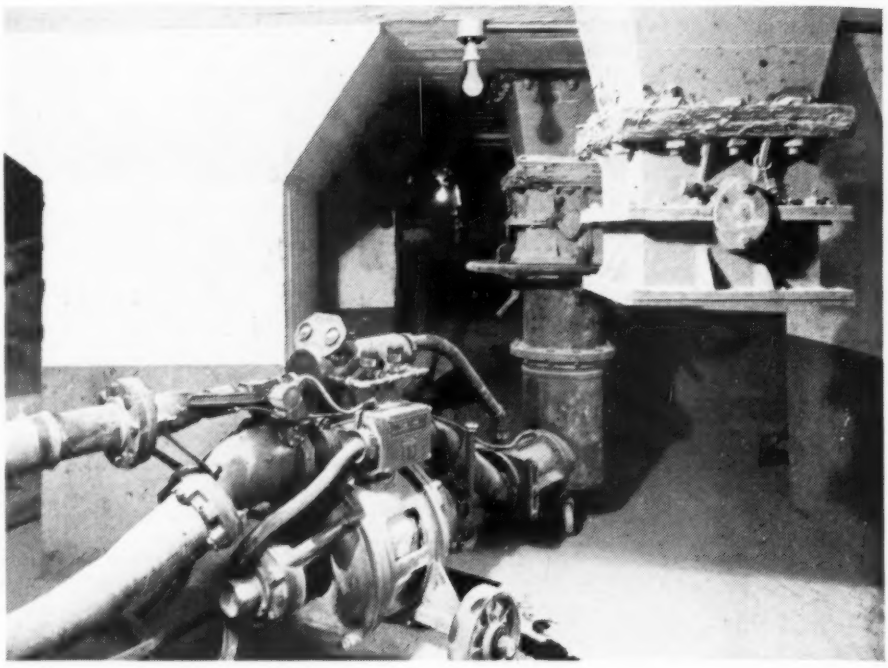
The chemical composition of the slags also affects their cementing value in a way that it is improved by high lime, high alumina, and according to some authorities, by high sulphides. Generally, though, the sulphides are not desired in large amounts, because of the feeling that they might contribute to rusting of steel reinforcement in concrete. Some authorities say that experience shows that sulphides do not cause rusting in portland blast-furnace slag cement-concrete. Most portland blast-furnace slag cement specifications require the chemical composition of the blast-furnace slag used to conform to the following:

$$\frac{CaO - MgO - \frac{1}{3}\,Al_2O_3}{SiO_2 - \frac{2}{3}\,Al_2O_3} \quad 1.0$$

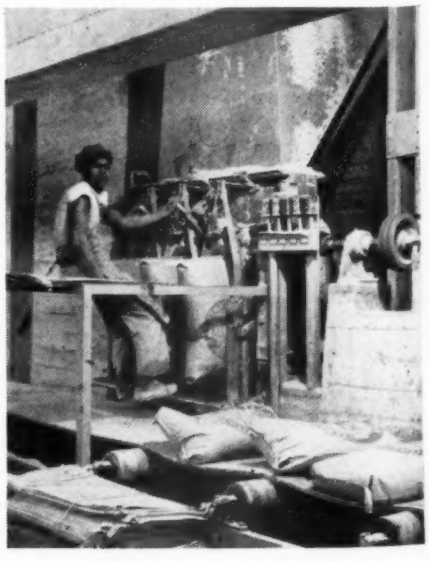
Physical requirements are almost identical to those for Normal or Type I portland cement in England, Germany, France, Japan, and also in the recent Tentative A.S.T.M. Specification in the United States.

Summarizing, it appears that portland blast-furnace slag cement has possibilities as an alternative to normal portland cement: Many of its properties being almost identical to portland. In special cases, such as where low heat of hydration or resistance to some aggressive agents is required, it might have some advantages over portland cement.

EDITOR'S NOTE: Portland blast-furnace slag cement is made in the United States, principally by the Green Bag Cement Division, Pittsburgh Coke and Chemical Co., located at Pittsburgh, Penn. This product has been manufactured at this plant since 1938; its production has steadily grown to the point where it now comprises over half of the company's total cement output. Users of this portland blast-furnace slag cement have found it to perform as satisfactorily, and in many cases to hold certain advantages over regular portland cement.



Cement pump installation under silos



Three-sack packing machine

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(2) Lea and Desch, **The Chem. of Cement and Concrete**, p. 276; also pp. 281, 287 and 290.
(3) Forsen, **Symposium on the Chem. of Cements**, p. 328; also pp. 301, 327, 329, and 331.
(4) Nagai, **The Cement Industry of Japan**, Japan Times and Mail, May, 1938.
(5) E. Deny and E. H. Lewis, **Transactions of the Faraday Soc.**, 1918.
(6) Passow, **Introduction of Slag into the Cement Ind.**, pp. 37-61, (N.S.A. file 53.9).
(7) Chem. Abs., 37 (1), 245 (1943).
(8) F. M. Lea, **The Institution of Civil Engr., Session 1942-43.**
(9) Davey, **Jl. Soc. Chem. Ind.**, 53, 343T (1934).
(10) Bates, **Uses of Slag**, Annual Meeting of the N.S.A., 3/28/24; their file 61-2.

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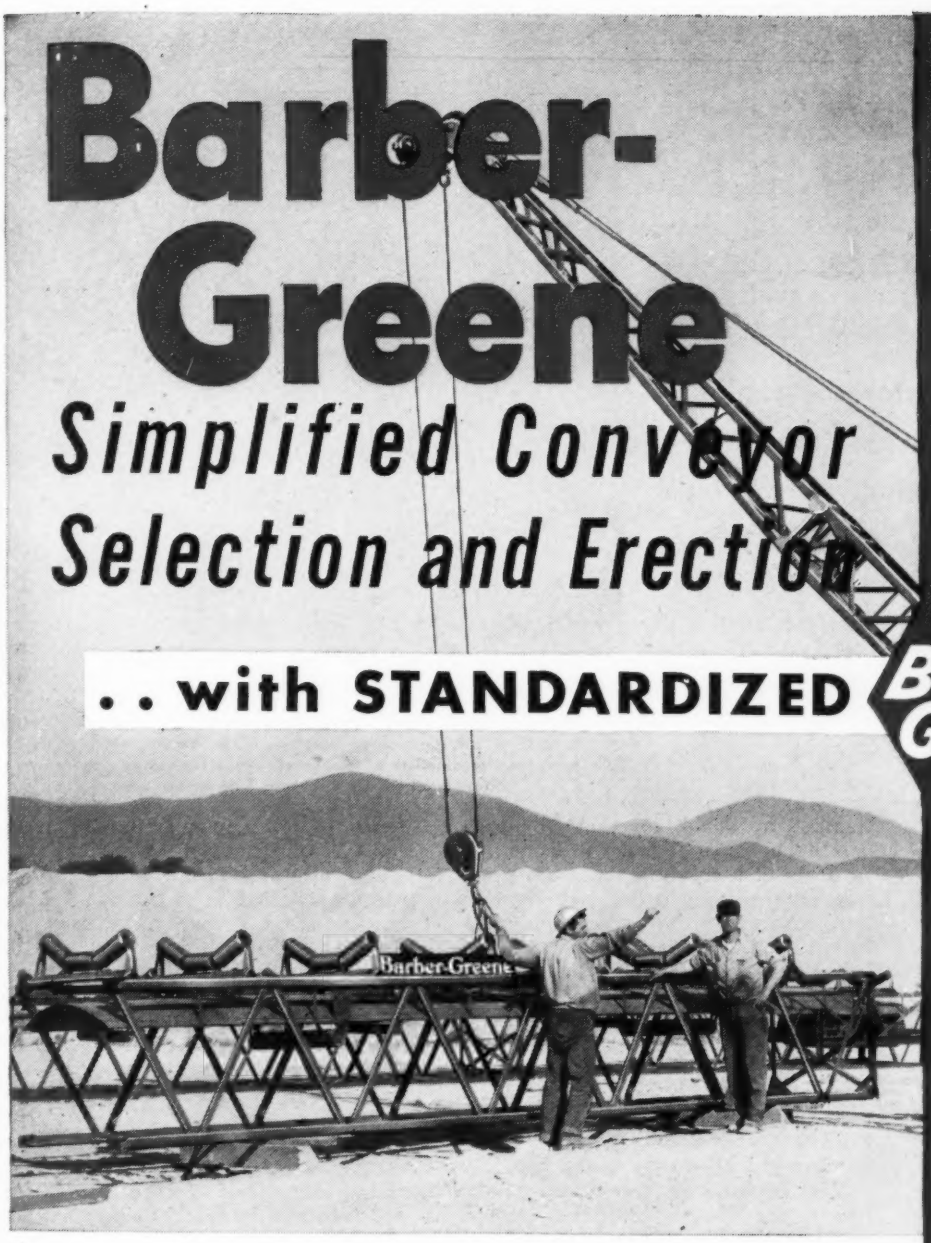

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Barber-Greene Permanent Conveyors are complete, self-contained, *standardized* units that can be bolted together quickly . . . easily altered and moved. Field assembly of miscellaneous pulleys, bearings, and dozens of other parts is completely eliminated. The *pre-engineered*, factory-assembled terminals operate at top efficiency . . . reduce maintenance expense.

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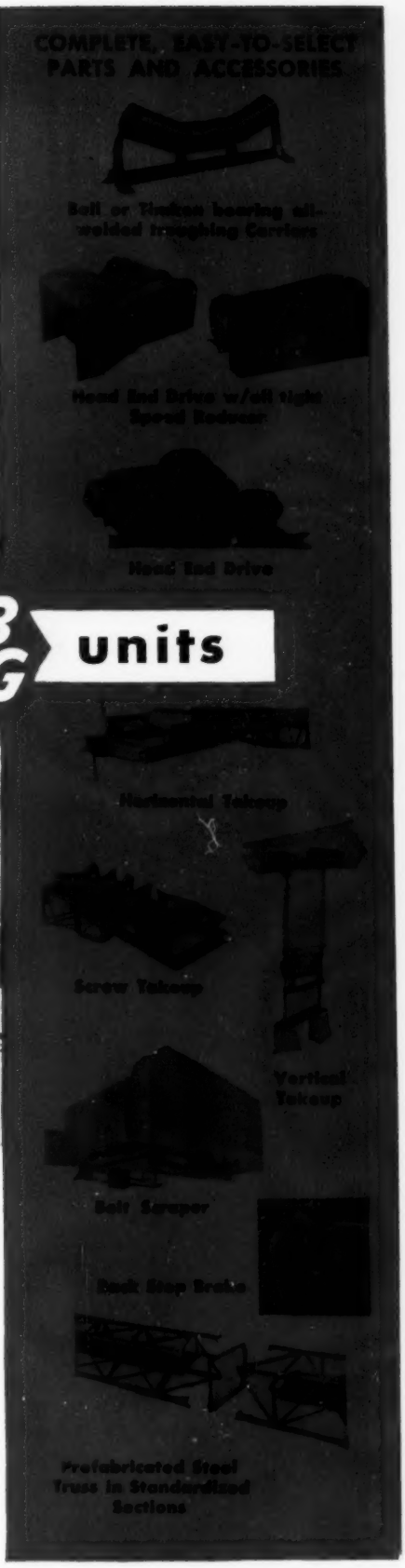

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PROCESSING PUMICE For Aggregate

Cochiti Pumice Co., has interesting plant set-up for the production of carefully graded pumice aggregate. Product, marketed through Pumice Aggregate Sales Corporation, is shipped as far east as New York.

After pumice passes through crusher it is elevated by bucket elevator, left, to first screen to remove oversize. The bucket elevator to the right elevates the blended or separated gradation, as the operator desires, from 36-in. conveyor belt below bins

IN the short span of two years, the Pumice Aggregate Sales Corporation, Albuquerque, N. Mex., together with the Cochiti Pumice Co., under the same ownership, has become the largest producer of pumice aggregate in the United States. The latter company handles the mining, grading, and loading operations, while the former has the sales and promotional responsibility.

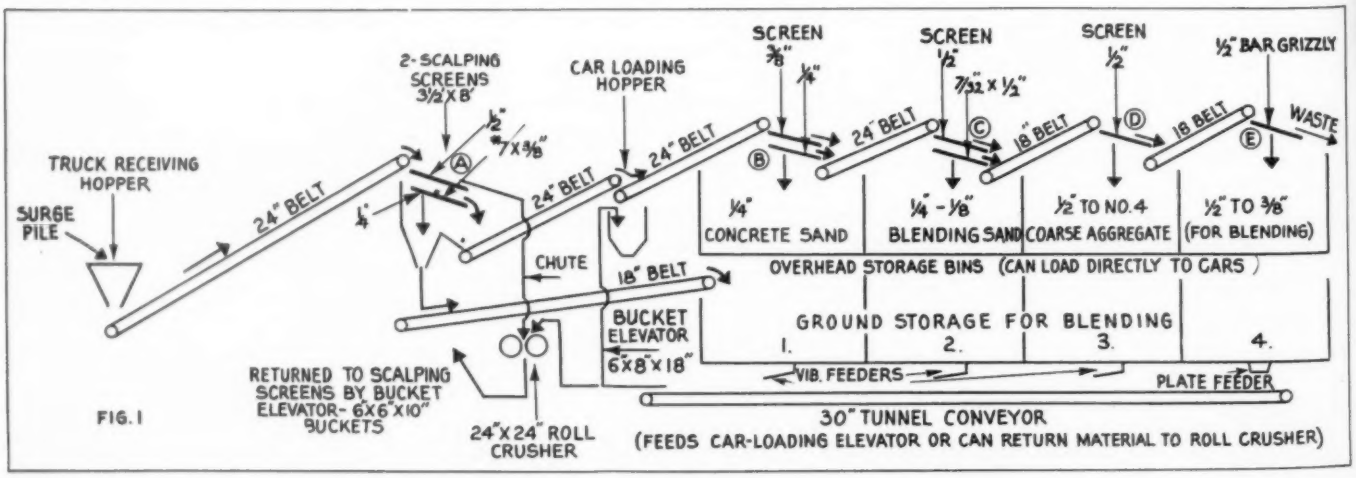
Under the able leadership of T. Jack Foster, recently elected president of the Pumice Producers Association, pumice aggregate has been shipped into at least sixteen states, with Buffalo, N. Y., the most distant point. While the biggest volume is going into Colorado, Kansas, Oklahoma, and Texas, regular customers of the Pumice Aggregate Sales Corp. are to be found as far away as Michigan, Indiana, and Minnesota.

The grading of "pit run" pumice is not all that could be desired and may be somewhat erratic even within the same location. In recognition of the importance of uniform grading, this company has built a large grading plant at Domingo, N. M., the nearest railhead to their deposits. There was little precedent from which to draw in building a plant for grading pumice aggregate, but through trial and error the present plant resulted, and is now splitting the material into different gradings which may be recombined onto a blending belt through manipulation of Syntron feeders to produce a controlled gradation. Additional trackage has been completed recently which provides a capacity of 48 empty cars east of the loading point with room for a like number of loaded cars to the west.

Vast deposits of the natural pumice lie in the Jemez mountain range, particularly along the east side of Valle mountain, an extinct volcano, the beds varying in depth to 75 ft. After a light overburden has been removed, the pumice is bulldozed to a trap from which a belt conveyor loads 10 cu. yd. trucks for the haul to the Domingo plant, a distance of 15 to 18 miles over unimproved dirt roads.

By referring to the flow-sheet, the plant operation is as follows:—Haul trucks drive across a grizzly over the feed hopper to dump the load. If the hopper is full, the trucks dump at the toe of a surge pile from which the plant may be fed by bulldozer. A 24-in. belt conveyor takes the pit run material to a pants-leg splitter which divides the feed to the two scalping screens at location "A." Material retained on the top decks passes through a grizzly which removes roots and is then chuted to the roll crusher and returned by bucket elevator. Material passing through the bottom deck is conveyed by an 18-in. belt directly to ground storage bin No. 1 as pumice concrete sand. The amount of sand removed at this point can be controlled, and a portion of sand can be diverted into material retained on

(Continued on page 104)



Flowsheet of pumice aggregate crushing and screening plant

40 years of friendship

It was back in 1908 that the first mechanized packer was offered to the lime and limestone industries. Then, early in 1927, the multiwall paper bag was generally adopted as the standard package for the non-metallic minerals industry.

St. Regis has offered constant improvements in the making of paper and bags. For instance we have developed such uses as the moisture-proof sheet, and extended valves and inserts, so that lime for the agricultural, chemical and construction industries can be shipped in more completely hydrated form and in much finer particles.

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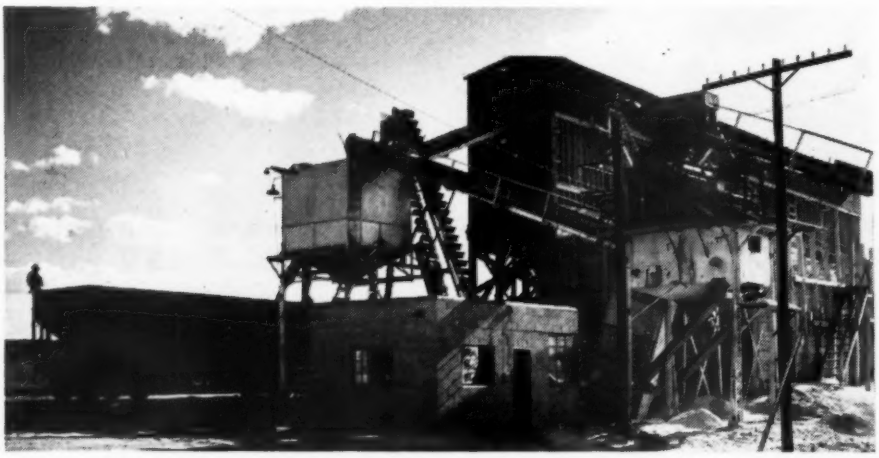
ST. REGIS PACKAGING SYSTEMS

Bucket elevator carries pumice from the blending belt conveyor and loads it into freight cars or it may be diverted to the conveyor at top left to be placed in another bin for storage



From the control house in the foreground, the entire plant is operated by push-button control. Above the bins, to the right, are screens to separate pumice into various gradations

the bottom deck which is conveyed to the top of the car loading bin where it is normally transferred to another conveyor which feeds a two-deck Universal screen at "B." This is the first of a series of screens on top the overhead bins. Screen "B" removes more concrete sand through the bottom deck. Two decks are used simply to control the load on the bottom deck. All material retained on the bottom deck at "B" is fed to screen "C," another two-deck Universal. Here again the top deck controls the load on the bottom deck. Material passing this screen is minus ¼-in. with little fines and is used for blending purposes. Material retained goes to screen "D," a single deck Universal where coarse aggregate ½-in. No. 4 is made. Some material overrides screen "D" and is passed through a grizzly at "E" where any remaining roots or oversize are chuted to waste. This material stored in bin No. 4 is held for blending purposes.

From the overhead bins, chutes lead to the ground storage bins, and it is from these bins that material is blended to meet close specifications. The rate of feed of each of the Syntron feeders is varied independently to produce the desired blending grading. A 30-in. tunnel conveyor delivers the blend to a bucket elevator which in turn feeds the steel bin from which cars may be loaded on either of the two tracks.

The entire plant is electrically operated with all controls located on a large panel in the control house. From the control panel, the operator can see into the crusher pit and, in fact, can see all units of the plant except for the screens which are located inside the enclosure on top of the overhead bins.

JOHN C. CAMERON, plant superintendent, stated that a new 3½- x 8-ft. single-deck screen has been ordered to replace the smaller screen at location "D." The smaller 3½- x 5-ft. screen will then be used to replace the grizzly at location "E." A new roll crusher has been ordered which will be installed under the bin which supports screens at "A," and is to be arranged so that it may be used either for coarse or fine reduction as required by grading of pit run material.

The future of New Mexico pumice is enormous. In a year and a half of operation, pumice supplied by the Pumice Aggregate Sales Corporation has been specified in schools in Oklahoma and Elkhart and Hugoton, Kansas; in extensive construction at the Universities of New Mexico, Oklahoma, and Tulsa and at the Oklahoma A & M College; in a hospital at Altus, Oklahoma; in over 150 houses at Sandia Base in Albuquerque; in a hotel at Duncan, Oklahoma; in clinics in Oklahoma City and Norman, Oklahoma; in a $3,000,000 apartment project in Norman, and in many other equally large construction projects.

Opens Gravel Plant

F. H. BREWER CO. has opened a new gravel plant behind the old Wilson gravel pit south of Lancaster, Ohio. The company specializes in road resurfacing, highway contracting and street work. The asphalt plant has a capacity of 70 tons per hour, and the gravel plant is able to produce 125 tons per hour, F. H. Brewer, president of the company, states. Charles Alley is vice-president and treasurer of the firm, and Paul Wright is office manager and secretary.

Manufactures Vermiculite

J. B. VINCENT has announced plans to manufacture "Permalite," a tradename for vermiculite, at Henderson, Nev.

Overall view of pumice processing plant and storage bins

Self-powered Telephone

WHEELER INSULATED WIRE CO., Waterbury, Conn., is producing a self-powered telephone especially designed

Self-powered telephone effective 20 miles

for applications where power supply is uncertain, as the unit requires no batteries or other power supply. The telephone system is supplied as standard for two-station, pair phone operation, and is said to be effective in installations up to 20 miles.

Large Impeller Crusher

NEW HOLLAND MACHINE CO., New Holland, Penn., is now testing a pilot Model 5050 double-impeller breaker which is similar in principle to the Model 3030. This new model is designed to produce aggregate in two sizes, minus 8-in., and minus 3½-in. A complete description of the Model 5050 appeared in the July, 1947, issue of ROCK PRODUCTS, but the illustration was that of the Model 2020.

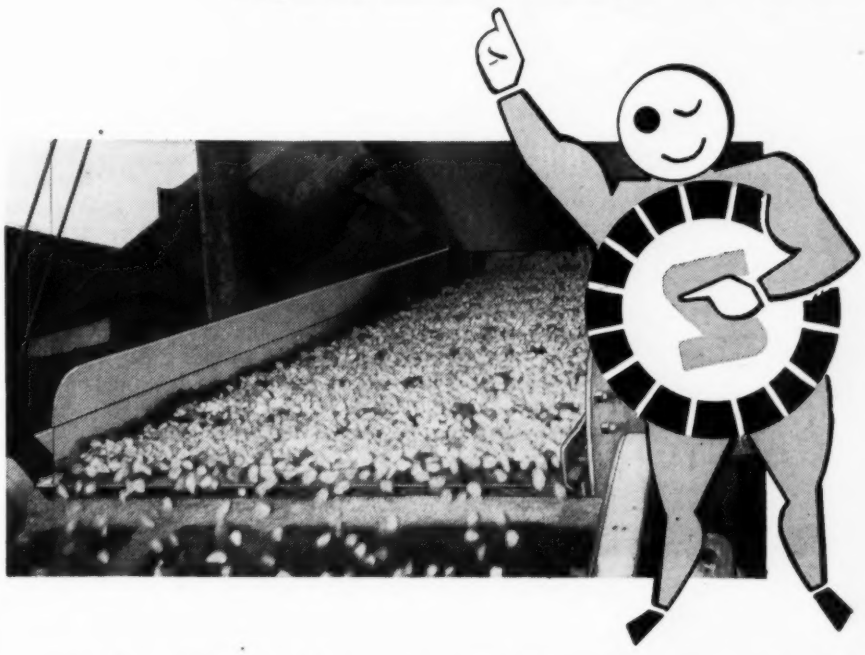
Model of impeller crusher capable of taking stone pass in a 50-in. square opening

QUESTION:

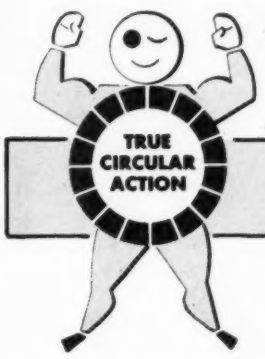
Why longer life with SECO vibrating screens?

ANSWER:

SECO'S PATENTED EQUALIZER ASSEMBLY



The Seco Vibrating Screen pictured above has been on the job for Buffalo Slag Company continuously for nearly eleven years. Behind this and hundreds of other outstanding Seco performance records is Seco's exclusive engineering feature - - the patented Equalizer Assembly. This sets up a fully controlled true circular action at all times - - for greater screening efficiency - and smooth, trouble-free performance. Get the whole Seco story. Send for A Guide to Better Screening.



Write Dept. M for A Guide to Better Screening.

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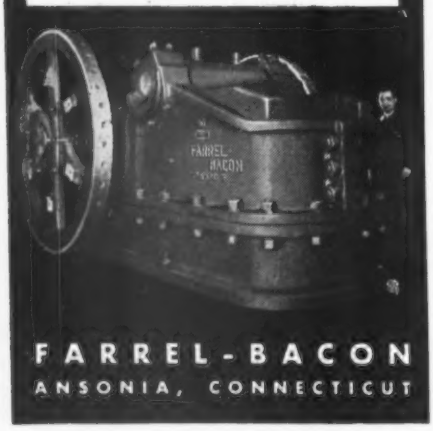
Design features of this 36 x 30 E stone crusher include: (1) Meehanite frame, sectionalized when necessary; (2) removable water cooled bearings; (3) improved design of swing jaw bearing; (4) force-feed oil lubrication, or circulating system if desired; (5) split flywheels; (6) flat or V-belt drive.

Write for further details or engineering help. BA-1



FARREL-BACON
ANSONIA, CONNECTICUT

Silica Plant Modernization

(Continued from page 81)

in place of one so that the feed from the silo will be a more uniform blend. The belt discharges to a 4¼-ft. standard Nordberg Symons cone crusher, set for ¾-in. opening. Plant terminus of the tramway is on a hill for partial gravity flow of material through the

R. W. McAllister, general superintendent

plant below. Immediately alongside the silo is a surge hopper for receiving truck deliveries of quarry stone. Stone from the hopper passes over a bar grizzly, set at 35 degrees, to a 30- x 36-in. Traylor jaw crusher, which performed primary reduction before the quarry crusher and tramway were installed, and which is kept in operating condition as a stand-by unit.

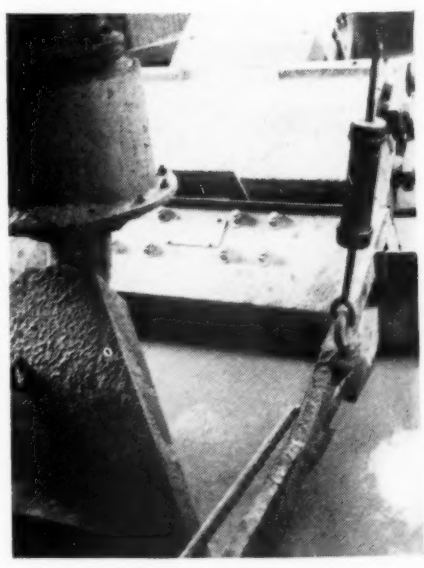
Secondary crusher discharge is to a 30-in. feeder belt for transfer to a 30-in. belt on 200 ft. centers for elevation to the top of the first of three concrete stave silos of 400-ton capacity each. Two slightly inclined conveyors operate between silos 1 and 2, and 2 and 3. If both short conveyors are operating, the first receives material from the 200 ft. belt carrying the crusher discharge, dumping it to the second conveyor which discharges to silo No. 3. If silo No. 2 is to be filled, the final conveyor is stopped and material slides back into the middle silo. Silo No. 1 is filled by the same method, with discharge from the long conveyor falling to the first short conveyor and sliding back to the first silo.

Eight of these large Marietta Concrete Stave silos are used at various points in the flow at this plant: one silo receiving tramway discharge; three silos storing secondary crusher discharge; two silos holding finished glass sand; and two storing finished steel sand. The last four are located at the rail siding for car loading. The three 400-ton silos receiving the secondary crusher discharge serve as feed hoppers for three chaser mills (for discussion of plant flow at Central Silica Co., see ROCK PRODUCTS, Sept. 1941).

Several major changes in plant flow are now underway since completion of the tramway installation. Possibly the greatest change here will be the anticipated replacement of chaser mills by rod mills. One 6- x 12-ft. Allis-Chalmers rod mill is now being installed that will receive its feed via a conveyor belt system from electro-magnetic feeders under the secondary crusher discharge silos. Mr. McAllister states that if this mill works as expected, a second one will be installed, with the combined capacity of the two replacing three chaser mills now in service. Discharge from the rod mill will be elevated to a separation tank by an Allen-Sherman-Hoff sand pump The same pump is now elevating chaser mill discharge.

Under-Water Screen

The 12-ft. diameter separation tank, constructed by Central Silica Co., has a 60-degree conical bottom, and clay and other foreign material flows to waste over a circular weir. Underflow from this separator, controlled by a Cash valve that maintains a minimum sand level in the bottom of the cone, is piped to a Jeffery-Traylor 60- x 84-in. under-water electro-magnetic vibrating screen. Discharge from two chaser mills is now pumped to this system rather than the sand de-watering screws formerly used at this point in the flow. The under-water screen, fitted with either 10- or 16-mesh screen cloth, is totally submerged in a 10-ft. square tank. Hydraulic action occasioned by the vibrating action of the screen forces water up or down through the screen openings, thus preventing blinding and greatly increasing screening capacity. Oversize on the under-water screen can either be returned to mills in a closed circuit or piped to yard storage.



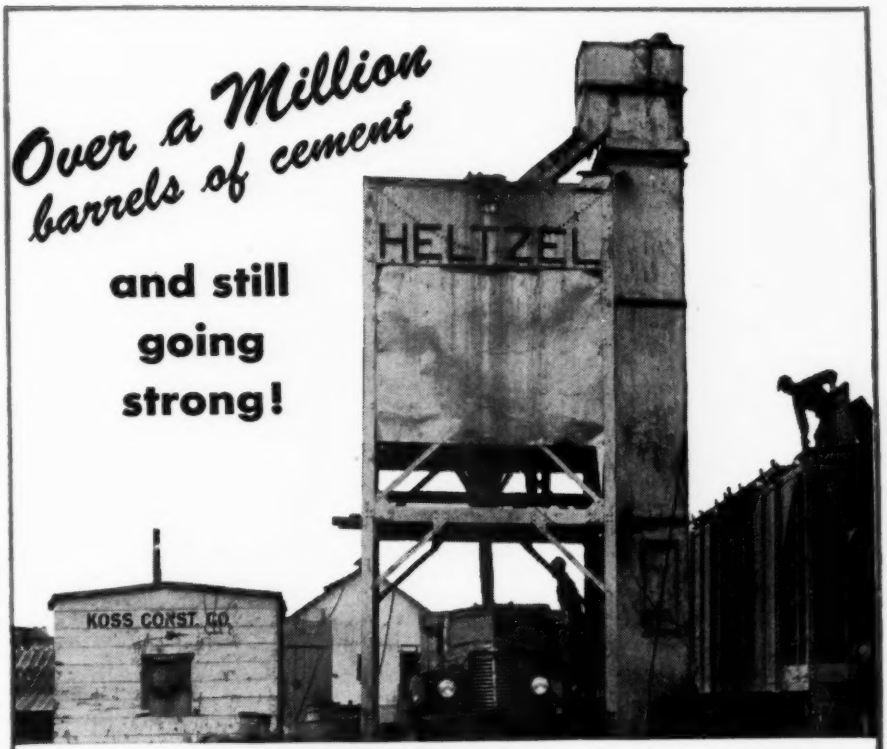
Under-water electro-magnetic vibrating screen. In the foreground is feed pipe

Throughs from the under-water screen, minus 10- or 16-mesh, are piped to a Cash valve—controlled feed hopper ahead of a launder-type classifier for removal of objectional fines and foreign material. Overflow from the classifier, 3 to 5 percent solids, is piped to a 14-ft. Dorr hydro-separator. But here the flow is being changed by by the introduction of a 120-ft. Dorr thickener ahead of the hydro-separator. Overflow from the thickener will be returned to mills for re-use as make-up water and underflow, approximatetly 70 per cent solids, will be pumped to the hydro-separator by a Wilfrey sand pump. Overflow from the hydro-separator, principally clay, is piped to waste. Underflow is pumped to a 3-cell Fahrenwald classifier by a 6-in. Denver diaphragm pump. Overflow from this classifier is piped to waste; underflow, principally minus 100-mesh, is transferred by a belt conveyor to yard storage.

Underflow from the launder-type classifier, approximately 50 percent solids, is pumped either to yard storage or to the leaching process plant. Material flow through the chemical plant has not been basically changed from the description presented to the Industrial Minerals Division of the American Institute of Mining and Metallurgical Engineers, meeting in Columbus, Ohio, October 23, 1946, as reported in ROCK PRODUCTS, December, 1946, page 71. Only change contemplated in the immediate future in the leaching plant will be installation of a 5- x 40-ft. McDermott direct heat dryer. To obtain a uniform flow of heat, the steel sand dryers are coal-fired by stokers thermostatically controlled natural gas balancing the fluctuating heat generated by the stokers. This combined type of heat generator was designed to take advantage of the comparatively low cost of coal.

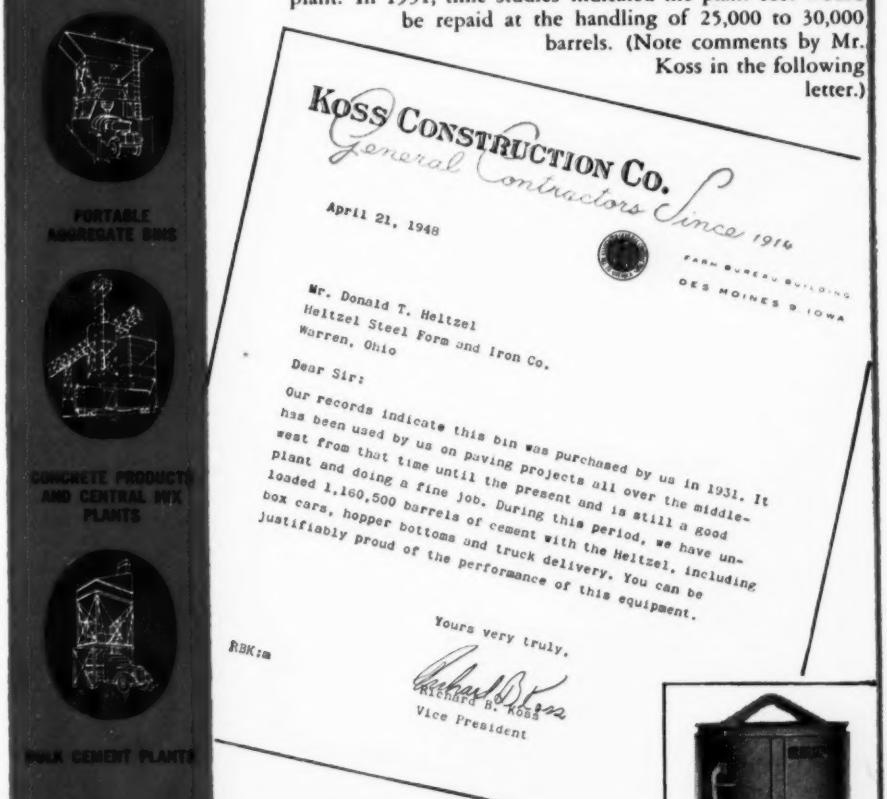
From the steam coil dryers in the leaching plant, glass sand is elevated to two storage silos for car loading. Almost all glass sand produced at this plant is shipped in covered hopper cars. Steel sand is moved from yard storage by a 1½-cu. yd. Sauerman slack line bucket which deposits it in a hopper over a belt conveyor for transfer to a dryer building, from which it is conveyed by belt to two storage silos for box car loading. Stephens-Adamson loaders are used for all box car loading. Plans have been drawn up for complete renovation of the dust control system and improved bagging equipment in the pulverized silica section of the plant. Plans call for use of a Jeffrey feeder to transfer silica flour from a loading bin to packing machine, which will allow the complete operation of bagging to be performed without the introduction of compressed air into the flow of silica.

R. W. McAllister is general superintendent of Central Silica Co.; Harvey Ridenour is plant superintendent, and Lloyd Mack is quarry foreman.



VETERAN HELTZEL PLANT HAS REPAID ITS COST 42 TIMES OVER IN 17 YEARS . . .

• 1,160,500 barrels of cement have been unloaded by this plant. In 1931, time studies indicated the plant cost would be repaid at the handling of 25,000 to 30,000 barrels. (Note comments by Mr. Koss in the following letter.)



KOSS CONSTRUCTION CO.
General Contractors Since 1916

April 21, 1948

FARM BUREAU BUILDING
DES MOINES 9, IOWA

Mr. Donald T. Heltzel
Heltzel Steel Form and Iron Co.
Warren, Ohio

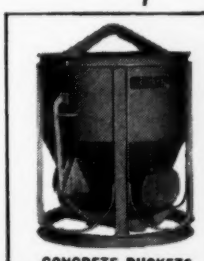
Dear Sir:

Our records indicate this bin was purchased by us in 1931. It has been used by us on paving projects all over the middle-west from that time until the present and is still a good plant and doing a fine job. During this period, we have unloaded 1,160,500 barrels of cement with the Heltzel, including box cars, hopper bottoms and truck delivery. You can be justifiably proud of the performance of this equipment.

Yours very truly,

RBK:m

Richard B. Koss
Vice President



CONCRETE BUCKETS

Heltzel plants are products of specialized engineering, and constructed for lasting, trouble-free service. Your requirements for plants will be served best by Heltzel. Write for information and literature.

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO · U. S. A.

Crushed Stone Directors Meeting

Directors' Meeting Brings Out Need for Larger Funds for Laboratory Work

THE SEMI-ANNUAL MEETING of the Board of Directors of the National Crushed Stone Association, at the Homestead, Hot Springs, Va., July 8, was concerned mainly with receiving and acting upon reports of the Association's officers and committees. Some changes were made in the Articles of Incorporation and Bylaws to take care of the change in name of what was formerly the Agricultural Limestone Division and is now the Agricultural Limestone Institute. There were no references in the discussions to the rival National Agricultural Limestone Association, so it may be assumed that the two groups are no closer together than they have been.

W. "STEVE" WESTON, JR., Columbia, S. C., president of the Association and chairman of the Board of Directors, presided and reported briefly on the present status of the industry.

Engineering and Research

A. T. GOLDBECK, engineering director, high-lighted a progress report. Typical of some of the interesting facts being developed by original research is this example: "In addition to routine tests [of a certain igneous rock] to determine its characteristics, tests were made to determine the durability of hot mix bituminous concrete made with one of the samples. The indications were that it would be best to use the rock investigated as coarse aggregate only, with natural sand fine aggregate and preferably with limestone dust filler. This combination gave the most durable mix when subjected to the action of water." It was brought out in other tests that silica dust makes a very poor filler for bituminous mixtures. As fine aggregate in some combinations silica sand appears to advantage.

The porosity or "air-leakage" of concrete blocks made with stone screenings was reduced 95 percent by a simple treatment developed in Mr. Goldbeck's laboratory. The blocks were for use in coal mines as brattices, and the mine management was at the point of rejecting the blocks because they leaked too much air under the 9 in. (of water) pressure with which the ventilating system supplied air to the mines. The leakage varied with different blocks, according to laboratory tests, but was about 0.6 cu. ft. of air per sq. ft. per min. The porosity was reduced to 5 percent of that figure by use of two coats of portland cement grout, made of equal parts by weight of cement, limestone dust, and water, applied to the pressure side of the block. The mine owners were satisfied with these treated block.

These two samples of the helpful work being done for member companies are picked at random from numerous examples mentioned by Mr. Goldbeck in his report. All these investigations were, of course, in addition to his more or less routine work of attending technical society meetings and taking an active part in committee work. Referring to the planning of future research he said: "An industry as important as ours should be able to support laboratory investigations costing at least $100,000 per year, instead of the few thousand we now spend on work of this nature."

Regarding the two most widely discussed problems in respect to concrete aggregates, Mr. Goldbeck had this to say: "The problem of reactive aggregates is in its infancy. I refer to the reaction between the alkalies in cement and certain types of silica in aggregates. This should be investigated in our laboratory, even though as yet we have not been too much bothered by this problem; but the lightning could strike at any moment." The other current and much discussed subject, he referred to as follows: "The question of compatibility of aggregates as it is affected by thermal coefficients of expansion of the coarse aggregate and the mortar is another problem which is coming very rapidly to the foreground. It has had a serious sales effect on certain types of aggregates, and a beneficial effect on others so far as acceptability is concerned. It appears that when there is too great a difference in thermal coefficient of expansion of the coarse aggregate and of the mortar, lack of durability of the concrete results when

Testimonial of Appreciation
by the
National Crushed Stone Association
to
Nathan C. Rockwood

WHEREAS, Nathan C. Rockwood, has for over thirty years been prominently identified with the editorial activities of ROCK PRODUCTS and of recent years has been its Editor in Chief; and

WHEREAS, Rocky, as he is affectionately known throughout the industry, has relinquished his editorial responsibilities and is now serving as an elder statesman for that publication and in such capacity continues to give us inspiring and helpful editorials and messages, and

WHEREAS, during these many years there have flowed and are continuing to flow from his prolific and capable pen words of encouragement and caution, words of praise and constructive criticism; and

WHEREAS, he has not only through the written word intelligently and sympathetically discussed our problems, but has also on many occasions at our annual conventions and other Association meetings advocated sound business principles and generously given counsel from his wealth of knowledge and experience; and

WHEREAS, he was one of the founders of the Manufacturers' Division of the National Crushed Stone Association and served capably for many years as its Secretary and by his inspirational thought did much to develop the success of that Division to the marked benefit of the Association; and

WHEREAS, it has been deemed fitting that our grateful appreciation to him for his devotion to our welfare be appropriately, even though inadequately, acknowledged; and

WHEREAS above all else he has been a loyal and faithful friend to all of us: Therefore be it

RESOLVED, That the Board of Directors of the National Crushed Stone Association, on behalf of the entire membership, hereby expresses to Nathan C. Rockwood its recognition of his outstanding and unselfish service to the Association and to the entire industry; and be it further

RESOLVED, That a copy of this resolution in appropriate form be presented to him as a testimonial of our personal affection, our highest esteem and with a keen understanding of his value to our industry.

Adopted by the Board of Directors of the National Crushed Stone Association at its meeting at Hot Springs, Virginia, on July 8, 1948

NATIONAL CRUSHED STONE ASSOCIATION · NCSA · 1918 ·

Testimonial scroll presented to Nathan C. Rockwood by the Board of Directors of the National Crushed Stone Association in recognition of his service to the industry and the association

it is exposed to freezing and thawing."

J. E. GRAY, field engineer, reported briefly. A few high points in his report are as follows: His work consists primarily of contacting member companies to find out what their particular technical problems are and how the Association may help. These contacts result in a great variety of experience with problems close to the producer's commercial interests, and an independent engineer's entrance into the picture is often very helpful to all concerned. He is now engaged in studying and assembling data on many special uses of crushed stone, especially limestone and dolomite.

Mr. Gray has found: "Work on these technical problems has been an involved job. On several occasions trips have been made to learn the true nature of the problem, for rarely can one be described with sufficient clarity in a letter to form a working basis. Generally, considerable study and research have been necessary before a solution could be found and a report written. Experience has shown that the greatest satisfaction has been expressed whenever it has been possible to arrange a meeting of the interested parties for a presentation and discussion of the reports on practical engineering problems."

National Activities

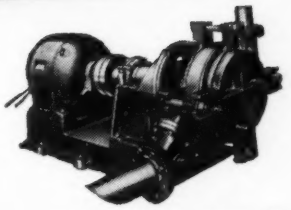
J. R. BOYD, administrative director, reported on various developments on the national scene which have their effects on the crushed-stone industry and many others—the steadily growing gains in the post-war highway program, federal aid, railway car shortages, the U. S. Supreme Court decision in the portland cement basing point pricing case, the effect of the defense program on the economy of the country, etc. The rest of his report had to do with the fiscal affairs of the Association. The Association now has about 120 active member companies and 80 associate member companies (equipment and machinery manufacturers). It is proposed to limit the associate membership, the Manufacturers' Division, to 100.

COTTRELL FARRELL, chairman of the Manufacturers' Division, reporting for the division told of the activities in obtaining new members since the convention last January—six new members. He said he expected the limited membership of 100 might be reached this year.

HORACE C. KRAUSE, chairman, Agricultural Limestone Institute, reported on the status of the federal conservation program. He said much progress is being made by the Institute in the preparation of a Handbook on Agricultural Limestone, which it is expected will be largely used as a school textbook. He concluded by saying that the outlook for this branch of the industry was bright indeed.

Reporting as chairman of a special

MORE EASILY CLEANED
for Batch Changes



MORRIS
TYPE "R"
SLURRY
PUMP

When you change over from one batch to another, you can easily dismantle the Morris Type "R". . . clean it thoroughly . . . put it back into operation in less time than most pumps on the market.

Impeller and shaft sleeve can be removed without disturbing the suction and discharge piping or the bearings. Simply loosen 4 bolts . . . slip them out of disc slots . . . then pull off end cover. Just as simple as that.

More Highly Resistant to Abrasion and Corrosion

Morris 84 years' experience in pump construction assures *longer pump service in your plant*. Just check these features and you'll know why.

The Type "R" has no internal studs or bolts. Minimum number of internal fits or joints, also minimum number of moving parts.

The gland is under suction pressure only. It is much less vulnerable to abrasion because it is not subject to high stuffing box pressures. Packing troubles are almost eliminated.

Wearing parts are more than twice as thick as conventional clear liquid pumps. Furthermore, Morris supplies parts of the alloys best suited to your mixtures and slurries . . . more resistant and more durable.

For the exactly right pump—the type best suited to your requirements—feel free to write us any time. *Remember . . . the right* pump for the job means longer service.

MORRIS MACHINE WORKS, Baldwinsville, N. Y.
Sales Offices in Principal Cities

MORRIS CENTRIFUGAL PUMPS

Crushed Stone Meeting

(Continued from page 109)

committee on percentage depletion of limestone resources, Mr. Krause was unable to tell of much progress in getting Congress to expand the revision of the internal revenue act which permits coal, petroleum and other mineral resource industries to write off a percentage of sales each year against depletion of the deposits and for development of new ones.

G. A. AUSTIN, past-president of the Association, as chairman of a special committee on election procedure and membership, reported the committee's suggestions regarding applications for membership in the Association, which were adopted by the Board.

RUSSELL RAREY, past-president, chairman of a special committee on revision of by-laws, reported the recommended revisions for taking care of the change of name of the Agricultural Limestone Division, already referred to. There were some other slight changes in other parts of the by-laws.

OTHO M. GRAVES, past-president, chairman of the committee on arrangements for the next convention reported in some detail the subjects to be considered and tentative selection of speakers. As usual, considerable time will be given to talks on subjects of general interest by speakers of national reputation.

After a round-the-table discussion of future convention cities, it appeared that there was considerable sentiment for a 1951 meeting in New Orleans or some other equally attractive winter place. The 1949 convention in New York and the 1950 convention in Chicago (with exhibits) have already been decided upon.

RUSSELL RAREY, reporting as chairman of a special unnamed committee, read a resolution drawn by the Executive Committee of the Association and submitted to the Board of Directors for its adoption. The resolution, beautifully engrossed and framed, is reproduced in the accompanying illustration.

NATHAN C. ROCKWOOD, the recipient, replied as best he could by reminiscing about the inception of the Association, the reason for its organization during the first World War and industry's first experience with a "controlled economy," with which even the youngest executives in the industry have now become more or less familiar by bitter experience. He called attention to the fact that while the birth of the Association is generally held to be the convention in Chicago in early February 1918, the inception was at Columbus, Ohio, a few weeks earlier. Present at the Columbus meeting were delegates from all the State Associations of which the organizers then had any record—Ohio, Illinois, Indiana, Wisconsin and Iowa. It is believed that none of that original group is now active in the Association. Of the original Board of Directors, elected at the Chicago meeting in February 1918, JAMES SAVAGE, treasurer of the Association, is the only member who has been continuously active during the entire period of over 30 years. Mr. Rockwood suggested Jim Savage was the one who deserved the honors.

Attendance

The following directors were present:

W. S. Weston, Jr., Columbia, S. C., president.
W. N. Carter, Joliet, Ill, vice-president
T. C. Cooke, Swampscott, Mass., vice-president.
V. C. Morgan, Louisville, Ky., vice-president.
W. T. Ragland, Raleigh, N. C. vice-president.
F. W. Schmidt, Jr., Morristown, N. Y., vice-president.
James Savage, Buffalo, N. Y., treasurer.
G. A. Austin, Decatur, Ga.
L. J. Boxley, Roanoke, Va.
J. Reid Callanan, South Bethlehem, N. Y.
Bruce S. Campbell, Towson, Md.
H. N. Clarke, Rochester, N. Y.
F. O. Earnshaw, Youngstown, Ohio.
Arthur F. Eggleston, Meriden, Conn.
Wilson P. Foss, III, New York, N. Y.
Otho M. Graves, Easton, Penn.
Norman E. Kelb, Indianapolis, Ind.
H. C. Krause, St. Louis, Mo.
R. T. Lassiter, Raleigh, N. C.
G. D. Lott, Jr., Columbia, S. C.
H. E. Rainer, Buffalo, N. Y.
Russell Rarey, Columbus, Ohio.
J. A. Rigg, Fort Spring, W. Va.
O. M. Stull, Buchanan, Va.
D. L. Williams, Ripplemead, Va.
W. F. Wise, Dallas, Tex.
Stirling Tomkins, honorary member, New York, N. Y.

Representing the Manufacturers' Division:

Cottrell Farrell, chairman, Easton, Penn.
J. B. Terbell, past-chairman, New York, N. Y.

Representing the Agricultural Limestone Institute, in addition to H. C. Krause, chairman:

P. E. Heim, Youngstown, Ohio.
S. P. Moore, Cedar Rapids, Ia.

Also the following guests were present:

J. C. Lawrence, Buchanan, Va.
A. W. McThenia, Fort Spring, W. Va.
Nathan C. Rockwood, Chicago, Ill.
R. B. Shepard, Raleigh, N. C.
Gordon R. Willis, Buchanan, Va.

New Army Engineer Tests For Aggregates

PRODUCERS OF MINERAL AGGREGATES are beginning to learn by experience that the Corps of Engineers, U.S.A., are tightening up specifications for concrete aggregates to be used in civil works construction. Foremost in intentions are elimination of concrete troubles alleged to be caused by "thermal incompatibility" of aggregates of different mineral composition and hence of different coefficients of expansion. For example, it is proposed to avoid the use of natural silica sand with limestone or dolomite coarse aggregate wherever possible, although it can be used with granite, quartzite and trap-rock coarse aggregate.

The Chief of Engineers, Lt. Gen. R. A. Wheeler, has made it clear, however, that there will be no hard and fast rules in this regard, and that in some structures natural sand is being used and will continue to be used with limestone coarse aggregates, where service records of the combination have proved satisfactory and the aggregate or aggregates come from established commercial sources.

Similarly, special attention will be paid to avoiding the use of portland cement and aggregate combinations that result in alleged alkali reactions, which have been given so much publicity in recent concrete engineering literature.

Laboratory Tests

It is emphasized that laboratory tests except for particle size gradation are qualitative only, designed to select the best available aggregates with due regard to local considerations of economy, the importance of the particular structure and the comparative quality of all the materials under consideration. A source of material may be approved, but subsequent acceptance of the products from that source are not necessarily acceptable. It is stated that the laboratory tests are not an attempt to simulate actual conditions of service, but merely to be used as a guide to judge quality — only "after all such tests have been completed on several different concrete aggregates will the results be used to determine which materials are acceptable."

TEST No. 1: Early petrographic analysis: For use as a guide to determine whether the material is suitable for further investigation.

TEST No. 2: Sodium and magnesium sulphate: This test is made solely as an indication of weakness in structural properties.

TEST No. 3: Specific gravity and absorption: An indication for long time durability, especially for reinforced-concrete in salt water.

TEST No. 4:Abrasion: An indication of structural sufficiency for concrete for certain uses.

TEST No. 5: Mechanical analysis: Since the advent of air-entrainment an important test for fine aggregate.

TEST No. 6: Thermal property study: The basis of durability or nondurability in some instances for aggregates that are otherwise structurally sound.

TEST No. 7: Thorough petrographic study: Necessary lest some weakness be overlooked.

TEST No. 8: Accelerated freezing and thawing at 12 cycles per day for not less than 300 cycles: As a guide in judging the trend of durability over a 100-year period.

TEST No. 9: Heating and wetting, and cooling and drying: To simulate weathering conditions in non-freezing climates and to serve as a check on the freezing and thawing performance.

TEST No. 10: Petrographic study of concrete specimens subjected to Tests Nos. 8 and 9: To determine what ingredients of the concrete may be primarily responsible for deterioration.

TEST No. 11: Alkali-aggregate re-

action: To determine what degree of reactivity may be expected if it is necessary to use a material.

In regard to this last matter — alkali-aggregate reaction—it is stated that there may be occasions where it will be necessary to use potentially reactive aggregates, and that when such conditions prevail the Corps of Engineers will specify low alkali cement, or perhaps the use of a puzzolanic material or some other neutralizing agent to alleviate or counteract the possibility of detrimental alkali activity.

Very accurate (labelled "ideal") grading of the fine aggregate is to be demanded because it is desired to use very lean mixtures, and because it is desired to avoid expensive cooling systems in massive structures such as high dams. The specifications for gradation of fine aggregates have not been definitely fixed for all such work, but the aim is to use an "absolute minimum of cement, sand, and water consistent with proper placeability."

Some idea of what fine aggregate specifications are coming to may be had from the following requirements contained in the specifications issued with an invitation to bid by the Corps of Engineers, Office of the District Engineer, Portland, Ore., District, for the McNary dam job, to be built on the Columbia river 145 miles upstream from Bonnerville dam.

Sieve Passing	U.S. Standard Retained on	Per cent by Weight Min.	Max.
	No. 4	0	5
No. 4	No. 8	5	15
No. 8	No. 16	10	20
No. 16	No. 30	20	30
No. 30	No. 50	20	30
No. 50	No. 100	10	20
No. 100		6	10

In addition to these grading limits, the fineness modulus shall be not less than 2.40 or more than 2.90, and during normal operations, the grading shall be controlled so that the fineness moduli of at least nine of ten test samples as delivered to the stockpile shall not vary more than 0.10 from the average fineness modulus. At the option of the contractor the fine aggregate may be required to be shipped in more than two sizes or classifications and be properly blended at the job.

Portland Cement Production

PRODUCTION of 17,740,000 bbls. of finished portland cement in May, 1948, has been reported to the Bureau of Mines, representing a 32 per cent increase over that reported for May, 1947. Mill shipments reached 19,544,000 bbls., an increase of 28 per cent above the May 1947 figure. Stocks of 16,077,000 bbls. on May 31 were 17 per cent below the May, 1947, figure. Clinker output in May, 1948, reached 17,617,000 bbls., an increase of 31 per cent over the corresponding month of the previous year.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	May 1948	May 1947	April 1948	Mar. 1948	Feb. 1948
The month	86.0	66.0	80.0	71.0	70.0
12 months	80.0	74.0	78.0	79.0	79.0

Save 50%
on Repair-Part Costs

Hard-surface with P&H Hartop electrodes—make your equipment last longer, produce more

Take a good look at this sprocket. Though badly worn, it is being built up with P&H Hartop. When the hard-surfacing is finished, this sprocket will cost ½ as much as a new one and will last 2 to 3 times longer. For Hartop's hard, protective coating gives you that much extra service. That's why using Hartop is a quick, low-cost way for you to keep your equipment at work longer, make it more productive. Hartop comes to you in handy weather-proof containers. You owe it to yourself to have a supply of these easy-to-use electrodes on hand. Four different types are available to give you the hardness you need:

Hartop Brown gives you a Rockwell C hardness of 35-40.

Hartop Green has a Rockwell C hardness of 45-50.

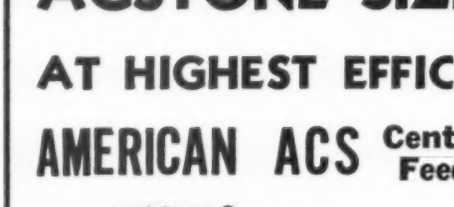
Hartop Red is still harder, giving you a Rockwell C hardness of 50-55.

And Hartop Yellow is the hardest electrode in the group — its Rockwell C reading is 58-63.

Use Hartop to keep your maintenance costs down and your production up. Ask your P&H distributor for our trial package containing all 4 types of these money-saving electrodes. It costs only $4.25. If he can't supply you, write us.

P&H WELDING ELECTRODES
4465 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

AGSTONE SIZING . . .
AT HIGHEST EFFICIENCY . . . . with
AMERICAN ACS Center Feed HAMMERMILLS



When sizing goes down to agstone—efficiency stays *up*—with an American Hammermill. These new American ACS Hammermills are designed with a special center feed, to lengthen the travel of the stone—and assure a higher ratio of fines. Quickly and easily adjusted to different sizing, Americans can add great flexibility and increase output on any size of operation.

BRUTE for heavy duty. BROAD HEAD for medium reduction. SPLITTER for fine reduction.

Americans Are Custom-Built! Three types of hammers offer a flexibility of crushing action to meet every need — and the number of hammer rows can be fitted to your specific reduction operation.

For further information, write for your copy of "Better Stone Crushing."

American PULVERIZER COMPANY

Originators and Manufacturers of Ring Crushers and Pulverizers

1245 MACKLIND AVE.
St. Louis 10, Mo.

The ¾ cu. yd. Sauerman Power Scraper pictured above keeps screening plant supplied with material that it scoops out of a wide bank of gravel. Cost is about 6c for each cubic yard of gravel handled.

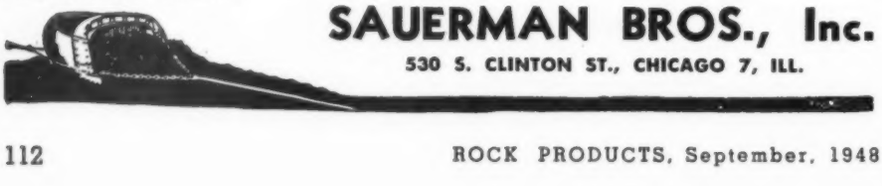
Sauerman Slackline Cableway digs deep under water and moves gravel to top of plant as fast as screens can do their work.

Big Savings at Your Command

Savings in cost, time and labor are your gains on dig-and-haul jobs with Sauerman Scraper or Cableway.

One-man control, fast and positive action. Reaches across a river, pond, pit, or to top of hill—moves material from any point within cable radius, and dumps automatically wherever desired.

Whether you handle small or large daily yardage, we can supply machine of capacity suited to your needs. Write for catalog and prices.

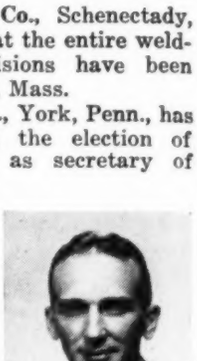


SAUERMAN BROS., Inc.
530 S. CLINTON ST., CHICAGO 7, ILL.

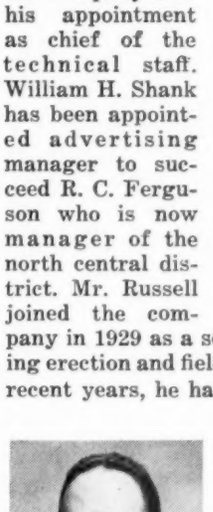
Manufacturers' News

General Electric Co., Schenectady, N. Y., announces that the entire welding equipment divisions have been moved to Fitchburg, Mass.

Hardinge Co., Inc., York, Penn., has recently announced the election of Robert J. Russell as secretary of the company and his appointment as chief of the technical staff. William H. Shank has been appointed advertising manager to succeed R. C. Ferguson who is now manager of the north central district. Mr. Russell joined the company in 1929 as a service engineer, doing erection and field servicing work. In recent years, he has specialized in the design and development of wet and dry grinding systems. Mr. Shank had previously been a staff member of W. H. Long Co., advertising agency in York, Penn. Prior to that he was connected with the York Corp. as manager of public relations and house organs. His Army experience included several years in the Corps of Engineers at Oak Ridge, Tenn., where he assisted in the development of uranium refining equipment for the atomic bomb.



Robert J. Russell



William H. Shank

St. Regis Sales Corp., New York, N. Y., has announced the appointment of George P. Haberstein as eastern sales manager of the Multiwall Bag Division, succeeding Walter M. Neill who was recently elected a vice-president of the sales corporation. Logan G. Hill has been named assistant eastern sales manager.

B. F. Goodrich Co., Akron, Ohio, has named George J. Fischer as manager of national accounts of the industrial products sales division. James M. Flounders succeeds Mr. Fischer as product manager in the division.

Westinghouse Electric Corp., Pittsburgh, Penn., has appointed Hobart C. McDaniel as manager of the technical press service in the public relations department, where he will have charge of the company's publicity in the technical and trade magazines. Mr. McDaniels succeeds Carl E. Nagel who has resigned to join McGraw-Hill Book Co. in New York.

Marion Power Shovel Co., Marion, Ohio, has announced the appointment of Paul Fenwick as manager of the New York sales office. His duties will

include export sales as well as domestic sales in the New York area.

White-Roth Machine Corp., Lorain, Ohio, has appointed George L. Roth as president of the company, succeeding G. A. White who has retired. I. G. Roth, who is also president of the Lorain Banking Co., has been named vice-president; M. J. Powers, formerly purchasing agent, has been elected secretary, and Harry Youtt, previously production manager, is now general manager. The new president is a graduate of Case Institute of Technology and during the war was a lieutenant in the Navy submarine section. His previous business experience includes service as chief engineer of the Franklin Engine & Mfg. Co., Franklin, Penn., and as vice-president of the Arms-Franklin Corp.

George L. Roth

Thermoid Co., Trenton, N. J., announces that A. Ray MacPherson has joined the company as manager of the industrial friction materials sales division, with headquarters in Detroit, Mich. He was formerly sales manager of Standco Brake Lining Co., Houston, Texas. Prior to that he was associated with Raybestos-Manhattan in various capacities.

Marion Power Shovel Co., Marion, Ohio, has appointed Stanley R. Shepard as district manager of the upper New York State district with headquarters in Albany. Mr. Shepard is well kown in the shovel and crane field, having been associated with the sales department of a manufacturer of excavating equipment for 23 years.

Bailey Meter Co., Cleveland, Ohio, has announced the appointment of H. T. Sawyer as manager of the Buffalo office, replacing S. W. Nelson, who died recently. K. E. Atwood has been named to succeed Mr. Sawyer as manager of the Seattle office.

Whittemann Machinery Co., Farmingdale, N. J., successors to E. B. Kelley Co., announces that E. B. Kelley has retired and that the business will now be known as the Whittemann Machinery Company.

Davey Compressor Co., Kent, Ohio, has appointed the George Park Tractor Co., Macon, Ga., to a full line dealership for the northern section of Georgia, adjacent to the territory covered by the Florida-Georgia Tractor Co.

Flexible Steel Lacing Co., Chicago, Ill., has appointed William W. Hickey as representative in the New England and New York territory. He succeeds John Ramsey who has been transferred to the executive sales office in Chicago.

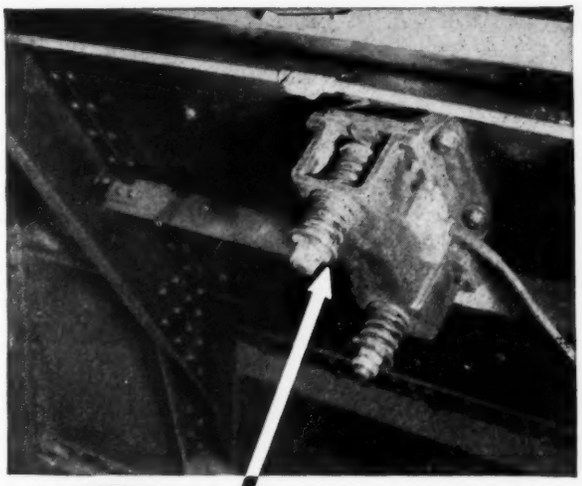
International Harvester Co., Chicago, Ill., is starting construction of a new wholesale distributing service parts depot in St. Paul, Minn. It will

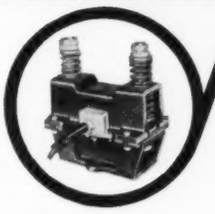
SYNTRON

"Pulsating Magnet"

ELECTRIC VIBRATORS

With Variable Controlled Power





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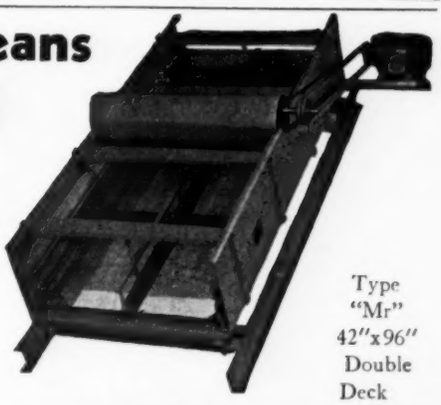
2 **Yet UNIVERSAL design provides higher productive efficiency in sizing the most difficult aggregates.**

3 **A wide range of UNIVERSAL models can answer your particular problem.**

4 **Write today for Catalog No. 107 on Screens and Screening.**



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RACINE - - WISCONSIN

serve as a distribution center for retail dealers in Minnesota, North and South Dakota, northwestern Wisconsin and northern Iowa.

Thew Shovel Co., Lorain, Ohio, has appointed M. B. Garber as general sales manager to succeed the late Don Savage who passed away July 25, just ten days after he had been promoted to vice-president. Mr. Garber was formerly assistant sales manager and export manager. Q. J. Winsor and J. T. Cushing have been named assistant general sales managers. Mr. Winsor previously held the position of assistant to the general sales manager and district sales manager for the East-Central territory, while J. T. Cushing was formerly district sales manager for the West Coast with headquarters in San Francisco.

M. B. Garber

Pioneer Engineering Works, Minneapolis, Minn., has announced the appointment of A. J. (Joe) Belanger as bituminous equipment sales engineer, serving as a specialist on sales in the United States and Canada.

Gardner-Denver Co., Quincy, Ill., has prepared a new 16 mm. film in color, with sound, entitled "Man Against Rock," featuring rock drilling, blasting, mucking, etc., on four construction projects.

Raybestos-Manhattan, Inc., Passaic, N. J., announces the manufacture of what is believed to be the longest hose of large diameter at the Passaic, N. J., plant, for shipment to a large Southern chemical plant and will be used to carry slurry through a tunnel.

Stearns Magnetic Mfg. Co., Milwaukee, Wis., has moved into the new addition to its Milwaukee plant which will house the general and executive offices, engineering department and laboratory. The new building is of brick and concrete design. Stearns Magnetic was founded in 1918 by R. H. Stearns in a small loft in downtown Milwaukee. In 1925 he was joined by his son, R. N. Stearns, who has since become vice-president and general manager.

St. Regis Sales Corp., New York, N. Y., announces the appointment of Howard C. Bryan as manager of the Minneapolis office of the Multiwall Bag Division. Mr. Bryan, formerly assistant manager at Denver, succeeds H. A. Hughes, Jr., who has been transferred to New York.

Link-Belt Co., Chicago, Ill., has announced the appointment of Crozier S. Wileman as district sales manager at Wilkes-Barre, Penn., to succeed A. C. Williams, who has retired after 43 years of service. He will be assisted by Alton H. Ziegler, who has been transferred from the Philadelphia district sales office.

Marion Power Shovel Co., Marion, Ohio, announces the appointment of John K. Dolan as district manager in charge of the Kansas City, Mo., office. He succeeds Milton S. Pohler, who has resigned to go into business for himself. Mr. Dolan's territory covers Kansas, Nebraska, Colorado, parts of South Dakota, Missouri and Oklahoma. He will make his headquarters at Kansas City, Mo.

E. F. Houghton & Co., of Canada, Ltd., an affiliate of E. F. Houghton & Co., Philadelphia, Penn., has opened a new plant in Toronto, Canada, under the direction of E. H. MacInnis, vice-president and director of sales. The new plant will specialize in the manufacture of metal working products such as carburizers, quenching oils, cutting oils, heat treating sales and drawing compounds.

De Laval Steam Turbine Co., Trenton, N. J., has announced the retirement of H. L. Watson as president after 35 years of active service. His successor is George W. Smith, Jr., who has been serving as assistant to the president since 1947.

Cummins Engine Co., Inc., Columbus, Ind., has acquired the Omaha, Nebr., Cummins dealership, formerly operated by Interstate Machinery & Supply Co., which will be operated as a wholly-owned subsidiary of Cummins Engine Co. Kendall L. Vinton, formerly manager of the Peoria, Ill., branch of Cummins Diesel Sales Corp. of Ill., has been appointed manager of the Omaha dealership.

Worthington Pump & Machinery Corp., Harrison, N. J., has announced the appointment of B. R. McBath as general manager. He was formerly assistant to the president of Ransome Machinery Co., Dunellen, N. J. and succeeds William H. Scherer, who has retired.

Stearns Magnetic, Milwaukee, Wis., announces that William Brunkala has been added to the technical staff at Milwaukee and will serve as an assistant to Harold W. Buus, physicist and research engineer in charge of the laboratory.

The National Industrial Advertisers Association, Chicago, Ill., announces that Gene Weyeneth, advertising manager for R. G. LeTourneau, Peoria, Ill., and Andy Andrews, head of the Arnold Andrews Agency, Milwaukee, Wis., were each awarded the Putman prize of $1000 given to individual advertising men in the competition for the best documented advertising campaign.

Bemis Bros. Bag Co., St. Louis, Mo., has purchased the land, buildings and equipment formerly owned by the Gallie-King Bag Co., Houston, Texas. F. V. Deaderick, manager of the Bemis factory at Houston, will supervise the new property.

B. F. Goodrich Co., Akron, Ohio, has announced the appointment of J. E. Carter, federal tax counsel for the company, as assistant secretary.

If you were there, you will recall that you saw WISCONSIN ENGINES wherever you turned . . . as standard power units on the machines of no less than 51 different construction equipment exhibitors, for a total of 185 engines on display (not including our own exhibit.)

No greater tribute could be paid to Wisconsin Air-Cooled Engines than this outstanding visual demonstration of "popular acceptance" by leading manufacturers of all types of heavy-duty motorized equipment. Where dependability and "Most H. P. Hours" of on-the-job service count, the preference is definitely and dominantly for Wisconsin Air-Cooled Engines.

WISCONSIN MOTOR CORPORATION

World's Largest Builders of Heavy-Duty Air-Cooled Engines

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INDUSTRY NEWS

Schedule ACPA Meeting

MEMBERS of the Executive Committee of the American Concrete Pipe Association will hold their next regular business meeting at the Broadmore Hotel, Colorado Springs, Colo., on October 22 and 23, Howard F. Peckworth, managing director, has announced.

J. A. Dunn, Swampscott, Mass., president, will conduct a discussion of routine business matters and the joint meeting of the board and the Technical Problems Committee at that time, after which the Technical Problems Committee will report on progress of hydraulic studies under way at St. Anthony Falls Hydraulic Laboratory, University of Minnesota. This is a joint project of the A.C.P.A. and Portland Cement Association.

Discussion will also cover final plans for the 41st annual convention planned for March 3-6 at Richmond, Va. George Denham, Faulkner Concrete Pipe Co., Hattiesburg, Miss.; H. W. Heath, Lock Joint Pipe Co., East Orange, N. J.; Elmer L. Johnson, Concrete Conduit Co., Colton, Cal.; and Edward Fox, Cincinnati Concrete Pipe Co., Cincinnati, Ohio, are the members of the Executive Committee.

Standard on Mortar For Unit Masonry

COMMITTEE C-12 on Mortars for Unit Masonry, American Society for Testing Materials, has approved for committee letter-ballot a new tentative specification for mortar for unit masonry covering mortars of four types and including two sets of requirements, namely; property requirements in which the acceptability of the mortar is based upon the properties of the ingredients and the properties of samples of the mortar mixed and tested in the laboratory; and proportion requirements in which the acceptability of mortar is based upon the properties of the ingredients and the proportions of these ingredients.

Buys Second Block Machine

DAKOTA LIME AND BRICK CO., Rapid City, S. D., has placed in operation its second Besser Vibrapac block machine, L. R. Kennedy, president and general manager of the firm, has announced. The Dakota firm has been incorporated only a few months. Ed Kenefick is secretary-treasurer.

Cinder Block Home

BUEHNER CINDER BLOCK CO., Salt Lake City, Utah, has constructed a 5-room cinder block home near Salt Lake which sells for $8400 including garage, lot, and landscaping, the company reports. The walls are built of the cinder block, and have been sprayed with a water and weather proofing mixture developed by the firm. Interior walls were given one coat of paint.

The blocks are made with a 4-in. triple dead air space. When this space is filled with insulation, heat loss is reduced by 30 percent, tests proved. The blocks can be sawed, nailed and cut as needed.

Concrete Pipe For Irrigation

IRRIGATION with concrete pipe is described in a new 56-page booklet published by the Portland Cement Association and prepared largely under the direction of W. G. Kaiser, Assistant Promotion Manager. Advantages of concrete irrigation pipe are outlined in detail. The publication also covers in pictures, diagrams and printed matter how concrete pipe is used for control and outlet structures, how to apply irrigation water to the land, furrow methods, and water needs of irrigated crops. A section is devoted to building concrete irrigation pipelines and structures and discusses preparing a trench for the pipe, laying of the pipe, mortar for laying and banding pipe, curing and protecting joints, backfilling trenches, making openings in pipeline, constructing vertical concrete pipe structures, and operating pipelines.

A section on designing concrete irrigation pipe systems includes solution of four actual problems encountered. Standard specifications for concrete irrigation pipe also are listed.

Concrete Floors For Basementless Houses

CONSTRUCTION of warm, dry concrete floors for basementless houses is described in a circular released by the University of Illinois. After testing nine different types of floor slabs the following recommendations for the type of floor required were given: Good drainage with a 4-in. fill of coarse washed gravel under the floor slab; a vapor barrier, consisting of a ⅛-in. rigid asphalt board over the fill and extending to the outside edge of the floor; and at least 2-in. of rigid waterproof insulation along the exposed edge of the floor and extending 2-ft. under it.

Sells Products Plant

C. J. WILKERSON has sold his interest in the Concrete Products Co., Irving, Texas, to J. H. Vollmer. Mr. Wilkerson still owns the company by the same name that he founded in Tucson, Ariz., however, although he reports that he is retiring from strenuous activity and will confine his activities to visiting other plants, giving advice on production and profits.

ELK RIVER PRODUCTS CO., Great Falls, Mont., has been established for the manufacture of concrete pipe and associated concrete products, Earl H. Eby, president of the firm, announced.

WILLIAMS BROTHERS transit mixed concrete firm, Maumee, Ohio, is producing concrete at the rate of 70-75 cu. yds. per day using three mixer trucks. Art Williams is in charge. A steel gondola car placed on heavy steel posts some 18 feet above the ground serves as a materials bin.

JAY MURRAY has established a concrete block plant at Albany, Mo.

THE ELSINOR CONCRETE BLOCK CO., formerly known as the Mortarless Cement Tile Co., has started production at its new plant in Riverside, Calif. Plant capacity has been increased approximately 200 percent with installation of new equipment, reports state.

WISCONSIN VALLEY CONCRETE PRODUCTS CO., Wisconsin Rapids, Wis., has expanded operations to include steel, serving as distributor of Butler-Built steel buildings produced by Butler Manufacturing Co., Minneapolis, Minn. Claude Murphy, vice-president of the Wisconsin Valley firm, will be in charge of sales.

VALLEY CONCRETE BLOCK CO., De Pue, Ill., has announced purchase of the building and equipment of the Illinois Concrete Block Co., formerly operated by Joseph Carey. In addition to the manufacture of light and heavy block of all sizes, the firm is an agent for steel windows, steel window sash and coal chutes, Hubert Arnold and Pat Mahoney, Jr., proprietors, state.

MODERN BLOCK, INC., Madison, Wis., has been organized to deal in building and construction materials and supplies and real estate. Capital is listed at $500 with 250 shares, par value $100. H. F. and Esther Severson are the incorporators.

SNYDER CONCRETE BLOCK CO. has been established at Marengo, Ohio, with a capacity of approximately 5000 block per day.

THOMAS L. AMIS AND O. B. ENGLISH purchased the concrete mixing plant from W. W. Caruth, Jr., at Dallas, Tex., and are now in production of ready mixed concrete with a daily capacity of 250 yds. Four new trucks, equipped with Hercules bodies, have been purchased and together with the plant represent an investment of $55,000.

TEKAMAH CONCRETE WORKS, Tekamah, Nebr., has started production of concrete block under the management of Donald Bealer who purchased the block equipment from Joe Marcoe.

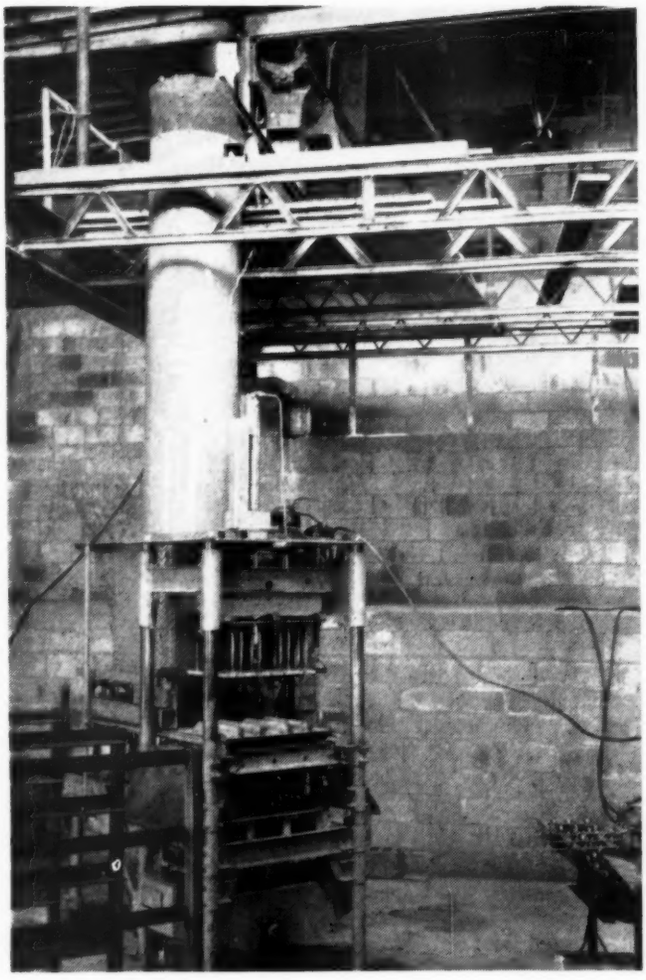
A. ZALZNECK AND SON, a ready mixed concrete firm, has been established at Corry, Penn., by Philip and Milton Zalzneck. Two trucks and mixing bins have been purchased.

MATT STODOLSKI has purchased the interests of Lloyd Scoblic in the Precast Concrete Products concern, thus dissolving the partnership and becoming sole owner.

Continuous Weigh-Batch and Mixing System

Luther Randolph, Ann Arbor, Mich., has new plant near Detroit equipped with hydraulically powered block machines. Continuous batcher and mixer operates satisfactorily

By DAVID MOCINE



Semi-automatic block machine receiving concrete through cylindrical feed-hopper and continuous mixer

FOR MANY YEARS an owner-operator of a high-pressure block plant located in metropolitan Ann Arbor, Mich., Luther Randolph recently started operation of a new low-pressure plant five miles from the center of this university town near Detroit. Demand for concrete block in this area is greater than could be supplied by the original plant, but since equipment for a new high-pressure plant was not readily available, the decision was made to build a block plant, using low pressure curing. The new installation, though utterly different from the old in every phase of operation from aggregate delivery to curing method, still embodies many refinements that were worked out through operation of the earlier plant. The high-pressure plant will continue to be operated.

The block machine in the new plant, with one or two refinements, is identical to a similar machine in the former plant. Both were designed and fabricated by Mr. Randolph. These machines are hydraulically operated, with vibration imparted to the block in the new machine through a patented mechanical process; while in the earlier machine vibration of block is accomplished by an electro-magnet. Mechanical vibration in the new machine yields a more dense block: weighing 6 lbs. more for an identical cinder unit than one made on the older machine. Though the owner is ore conservative, an operator of the new machine claims an hourly production of 800 8- x 8- x 16-in. block. The reason given by Mr. Randolph for constructing his own machine is that he is unable to buy a machine embodying all the refinements he wants in a single unit.

Overall view of plant. To the left is the truck hopper under cinder crushing building. Chute from top of building, center, is for oversize aggregate from screen. Below, to the extreme right, may be seen loudspeaker standards for drive-in theaters, one of the products manufactured

Refinements in New Plant Construction

Aggregate must be brought in to the old plant by rail or truck, but the new plant overcomes this intermediate handling by constructing the plant next to a gravel pit on land leased from the aggregate supplier. A cinder stockpile, 50 ft. behind the plant, is supplied from the University of Michigan powerhouse by company trucks. Cinders reclaimed from the stockpile by a ½-cu. yd. Unit dragline are loaded to either a 10-cu. yd. Heil or a 7-cu. yd. Galion dump body, both mounted on 2-ton Chevrolet trucks. Cinders dumped to a surge bin on the same level as the stockpile are discharged to an 18-in. belt on 20 ft. centers with flow controlled by a pan feeder powered by the same 3-hp. motor that drives the belt. This plant is built in a series of three steps down the side of a low hill bordering the

gravel pit. On the top step are receiving hoppers for aggregates; on the second level, cinder storage bins, proportioning and mixing equipment are located; and the block machine and curing rooms are on the bottom level.

Cinders from the hopper receiving stockpile material pass over a Stearns magnetic pulley for removal of tramp iron before being chuted to a New Holland hammermill, powered by a 10 hp. motor. Discharge from the hammermill is chuted to a roll crusher, with both rolls powered by individual 10 hp. fully enclosed Crocker-Wheeler motors. Roll crusher discharge is chuted to a 20-cu. yd. truck hopper, from which it is either trucked to the plant in town or returned to the top of the plant and dumped on the surplus stockpile to a 7-cu. yd. hopper on the same level as the hopper receiving cinders. The second hopper also receives pit run sand and gravel which is brought up from the pit in company trucks.

Either crushed cinders or sand and gravel is discharged from the hopper to an 18-in. belt on 36 ft. centers in the same manner as from the raw cinder hopper by a pan feeder, powered by a chain take-off from a belt pulley. All materials conveyed by the belt are discharged to a 3- x 6-ft., single-deck, cable-suspended Simplicity vibrating screen, fitted with ⅜-in. mesh. Throughs are chuted to one compartment of a six-compartment bin, with a total storage capacity of 100-cu. yd. Oversize is chuted to a truck hopper immediately adjacent to the hopper receiving processed cinders. This over-size is reclaimed by the gravel company, whose deposit is short of plus ⅜-in. material.

Continuous Weigh-Batch System

On the second level of the plant, a swing chute is placed under the discharge gate of the desired aggregate bin, with material flowing freely to the weigh batcher with the aid of a Syntron vibrator. Bulk cement is drawn from a bin on the same level as the aggregate bins, to a spout which discharges into a 6-in. screw conveyor on 14 ft. centers. Cement is discharged from the conveyor to a weigh hopper at the same point that aggregate flows from the swing chute to a second weigh hopper. Both continuous weigh batchers, of Mr. Randolph's design, consist of counter-balanced plates, fitted with aprons, that flip over to discharge their loads when the weight of material contained on the plate equals the weight of the counter-balance.

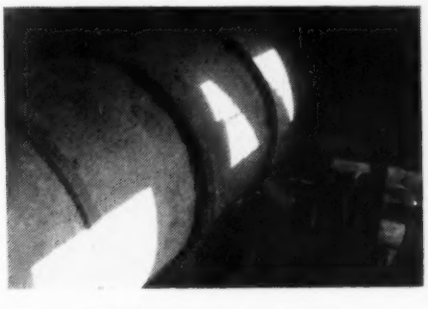
Material from the weigh hoppers is chuted to a dry-mix drum 4-ft. in diameter and 13-ft. long, which revolves at 20 r.p.m. The dry-mix drum is fitted with baffle plates to aid in mixing the ingredients. Discharge from the drum is chuted to the first of two Kent No. 2½ continuous mixers, each 9-ft. in length and powered by 5 hp. motors. Continuous mixers are used at this plant as a "means to an end," in that concrete ingredients had to be conveyed more than 50-ft., the distance represented by the three steps; and by this system both conveying and mixing problems are solved simultaneously.

Water is added in the first continuous mixer at the same point where dry-mixed concrete is received from the drum mixer. Discharge from the first continuous mixer is chuted to a second similar mixer another half-step down, with final discharge of finished concrete being to a 20-in. diameter by 8-ft. high cylindrical block machine feed hopper. Manual switches for starting or stopping all three mixers may be operated from the machine level, mixer floor, or top of the plant. A solenoid valve automatically stops the flow of water entering the mix when any or all machines stop operating. Mr. Randolph expects to add two additional continuous mixers to operate in parallel with the two now operating if it is warranted by machine production.

Controlled flow of water entering first continuous concrete mixer. Chute to the extreme right carries dry mixer discharge to continuous mixer

Block Machine Powered Hydraulically

All machine operation, with the exception of vibration, is accomplished through hydraulic action. Power for the machine is generated by a 10 g.p.m



Cylinder used for dry mixing

Cement falling through chute to weighing device before entering dry mixer cylinder. Aggregate from chute, to the left

Vickers hydraulic oil pump, powered by a 7½-hp. Westinghouse motor. Vibration for density control of block is provided mechanically from a 5-hp. motor through an O'Connor vibrator. Aluminum plain pallets are used, with three standard sized blocks being formed per pallet. Because of the speed at which the machine operates, a two-pallet off-bearer is provided: off-bearing six 8- x 8- x 16-in. block or equivalent at a time. A 10-hp., 40 c.f.m Quincy air compressor provides air for the off-bearer and other jobs in the plant. Six-tier racks, containing 72 blocks each, are transported on a Truckman gasoline powered lift truck

(Continued on page 135)

Final continuous mixer. Chute from first continuous mixer, above, may be seen to the right. To the left, the continuous mixer may be seen discharging to cylindrical feed hopper to block machine

General view of new block plant and curing rooms, to the right, and precast plant in the background

H. Lapham, manager of the Ojus operations

If Its CONCRETE-We Have It

Maule Industries, Inc., Miami, Fla., produces 45,000 block per day, joists, roofing tile, and ready mixed concrete

By W. B. LENHART

Two concrete masonry plants are operated by the Maule Industries, Inc., serving the Miami area. The older plant, started in 1937, is north of Miami about 10 miles at Ojus. The new plant, which went into production in January, 1947, is located a short distance west of Miami proper. This plant is located near the company's new crushed stone operation. Both plants have two Besser Super-Vibrapac machines which, at the time of inspection, were being run on a 20-hour basis and were turning out a total of 45,000 block per day. This production makes the company rank high as a producer of concrete block.

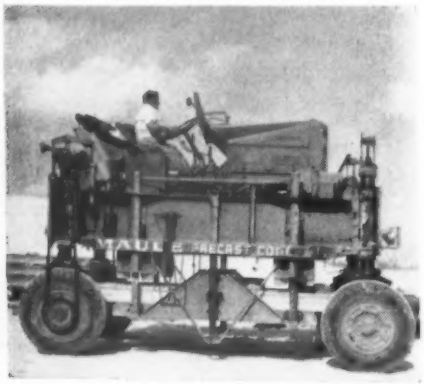
Both plants use an oolitic limestone aggregate produced by the company. Neither plant uses steam curing but stores the green block inside in rooms 24 hours after which they are strong enough to pile in the paved yard where they are sprinkled for seven days for further curing. Both plants keep about 300,000 block on hand.

The Ojus plant has two Warren yard hoists for handling the block, and the Red Road plant has a Warren and a Stearns stockpiling crane. The two latter are air-driven from a small centrally located air compressor. Five Clark 5-ton lift trucks are operated, two at Ojus and three new units at Red Road.

The block, which are white in color and of excellent appearance, easily meet the local specifications for strengths. The sand used is a crushed oolitic limestone which is basically the same in composition as the coarser aggregates. The limerock contains some silica.

The new plant at Red Road receives its coarse aggregate from a 24-in. Robins reclaiming belt conveyor that extends under ground stored materials. The weigh batcher, bins, and related equipment are all Butler. The two block machines are located on the ground floor in a row and the green blocks are hauled into one of 12 rooms that flank a wide passageway near the block machines. Experiments are being made in the plant with Darex air-entraining agent. Bulk cement is used. E. B. Mears is block plant superintendent.

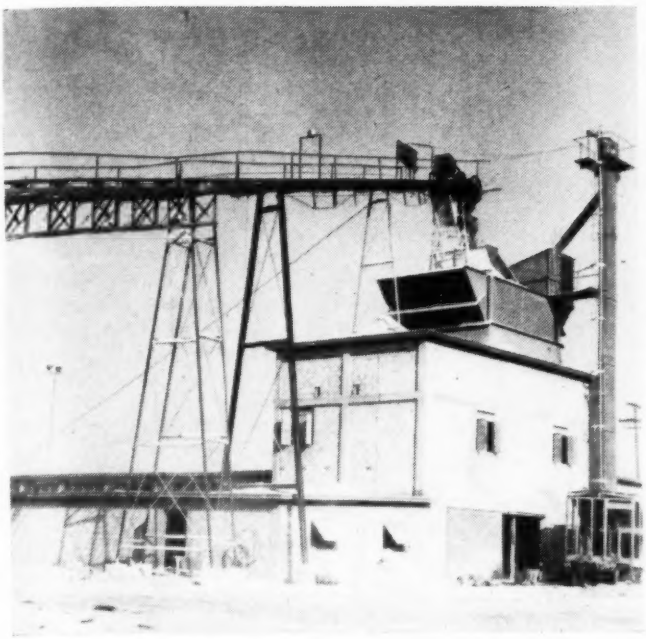
At the Red Road, Miami, Fla., op-



Straddle truck with load of concrete joists ready to make a delivery

Mixer trucks loaded with batched aggregates are driven under cement batch bins for the proper amount of cement

One of the long reclaiming conveyor belts serving the ready mixed concrete plant



Concrete block plant. One story section comprises a series of small rooms for initial curing—no steam is used

Reclaiming conveyor belt emerging from tunnel carrying concrete sand. Bin straddles sand belt and blends coarse aggregate with fines

eration, Maule Industries has a fleet of about 55 ready mixed concrete trucks. Jaeger, Ransome, Rex and Smith mixer trucks are used. The lay-out of the yard and method of loading this large fleet of trucks is interesting because the aggregates are charged into the truck mixer drum, using a 4½-cu. yd. Butler weigh batcher assembly, mounted under a 100-ton Heltzel bin, to weigh the two aggregates and the water. After receiving the aggregate and water, the truck is driven about 200 ft. to a second batcher (Erie) where the bulk cement is weighed out and added to the truck's load.

Ready Mixed Concrete

The first mentioned batching plant receives aggregates from a long reclaiming tunnel belt. Where this 24-in. belt emerges from the tunnel, a steel hopper straddles the belt and any special aggregates can be fed to the belt from this hopper. Portland cement is received at the plant in car lots. The company has its own Diesel-powered switch engine for handling this and other cars in and about the yard. The company is just starting to use Darex as an air entraining additive, preferring to use it at the plant to permit closer control.

Batching plant where aggregates are dumped into truck mixer drum. Cement is obtained at another batching station nearby

Yard stacker hoist operated by compressed air

Precast Joists-Roofing Tile

Another activity at the Red Road plant is the manufacture of pre-cast floor joists and roofing slabs which has developed into a flourishing business. It is a very simple operation, involving the use of a small Stearns mixer that dumps to wheelbarrows. Concrete is transported and unloaded either to the steel vibrating forms for the larger joist and beam units or can be "wheeled" to the slab section. At the time of inspection, a 30- x 36-in. reinforced slab was being made, using a simple form with units cast flat on a cloth covered concrete floor.

A novel feature of the joist plant was the use of a straddle truck for handling all phases of the joist manufacture. After the steel forms are assembled in the yard, the Ross carrier straddles the assembled unit and places it in the main shed where the forms are filled. The straddle truck later takes the green forms to the curing yard. When it is desired to make deliveries in the Miami area again the straddle truck is called into play. It simply drives over the bunker on which the joists are stored, picks up the load and is off in about the same time that it takes to read this. In addition to the straddle truck for deliveries, the Maule Industries have a Ford flat rack on which is mounted a crane that is powered from the main engine. By means of a sling, tile are loaded and unloaded by this unit. M. J. Hutson is in charge of the pre-cast section.

Pouring forms for reinforced concrete tile

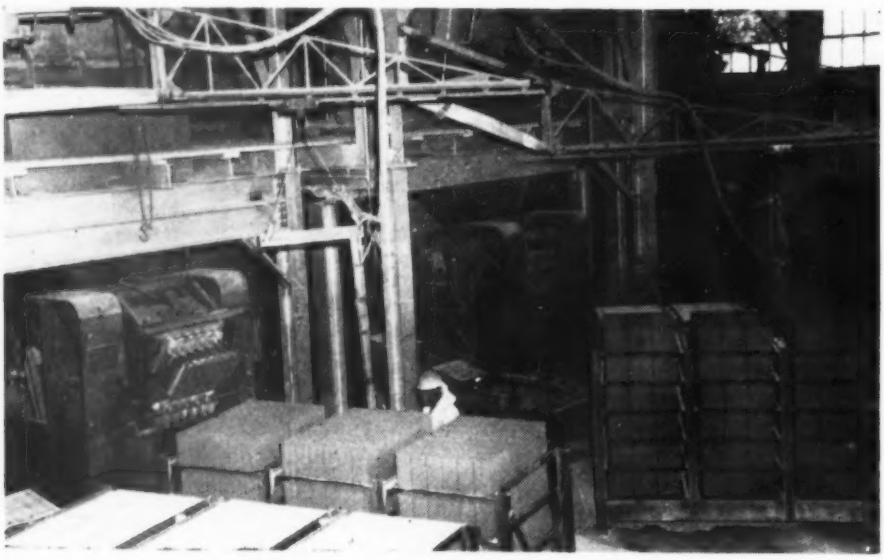
Highly MECHANIZED Block Plant

Cleveland Builders Supply Co., has a capacity of 36,000 modular block in a two-shift day with three machines

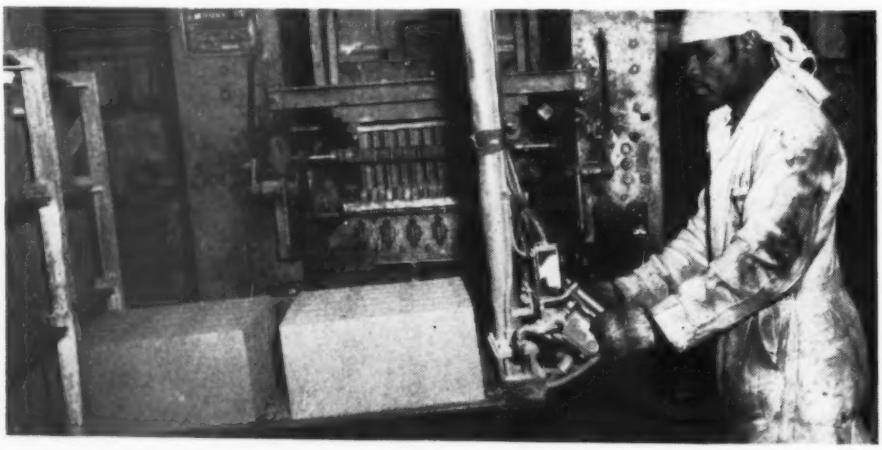
By DAVID MOCINE

WITH MODERNIZATION of its Hugo block plant, the Cleveland Builders Supply Co., Cleveland, Ohio, is capable of producing 36,000 modular block in a two-shift day with three Stearns No. 15 block machines. Started over 50 years ago in the building supply business, the present company was founded in 1919 with the merging and incorporation of 13 companies, including 14 brick yards. The company now produces clay brick and tile at two brick yards plus concrete brick and block at the Hugo plant. It also operates a plaster mill and coal yards. In addition to the foregoing, the company operates a fleet of 60 mixer trucks delivering ready-mixed concrete in the greater Cleveland area from five batching plants distributed throughout the city.

Sand and gravel dredged from Lake Erie is brought in by boat and stockpiled in company yards at the lake shore less than six blocks from the center of town for use by the ready mixed concrete plants or for sale to contractors. Coal and coke is delivered in 115 company-owned trucks (120 hired trucks) and a complete line of builders fireproof materials and stocks of sacked cement are maintained for the trade. The company has the exclusive dealership in four counties adjacent to Cleveland for Celocrete, enabling the Hugo plant to use this lightweight aggregate in all production of both block and concrete brick. Ready-mixed concrete may also be proportioned with lightweight aggregate when specifications so require.



Battery of three high-production block machines with mixers on mezzanine floor above



Off-bearing two pallets of concrete brick. Note controls on off-bearer, including button for stopping machine, the second for activating magnets for empty pallet return; a third for blowing dust off pallet; a fourth for stopping block machine; and a fifth for the electric-powered turntable control

Wishing to maintain the reputation built up over years of handling only quality products, Cleveland Builders Supply Co. officers spent a great deal of time and money in research to redesign its plant to economically produce high quality block. Jay Ehle, production manager of the Hugo plant, visited not only block machinery manufacturers, but also operating block plants, such as that of Illinois Brick Co., (*Concrete Products*, November, 1947, page 122). Mr. Ehle also has worked as Chairman of the Technical Committee to determine the proper curing cycle for specification block, sponsored by the National Concrete Masonry Association and other associations.

As a result of this research on curing, the Hugo plant maintains at least two weeks' production of block on hand at all times. When block in storage falls below this two-week minimum, sales of block are rationed, as management feels that green block do not measure up to company standards: although block produced at this plant passes grade "A" specifications at the end of seven days. Block is held at the plant through the second week for thorough drying by storing in an interesting form of cubing, to be described later. A covered storage area of 50,000-sq. ft. is provided. Biweekly tests for compressive strength, moisture content and absorption values are run on these block at a testing laboratory in Cleveland on a contract basis.

To keep in step with new developments Mr. Ehle firmly believes that "A block plant must be totally modernized about every six years." Operation of the Hugo plant is a case in point: commencing block production in January, 1940, with one Stearns No. 9 Joltcrete, a second similar machine was added in April of that year. A third machine was added in February, 1941, and a fourth in June, 1945. All four block machines were replaced with three Stearns No. 15 in March, 1948. This change to a higher capacity machine made necessary a change in all allied equipment, from the mixers to the kiln block

racks and covered storage area. Also coupled with this change in machines was a greater dependence on mechanical tools, cutting the total labor force from 33 men per shift with the No. 9's to 17 men per shift at present.

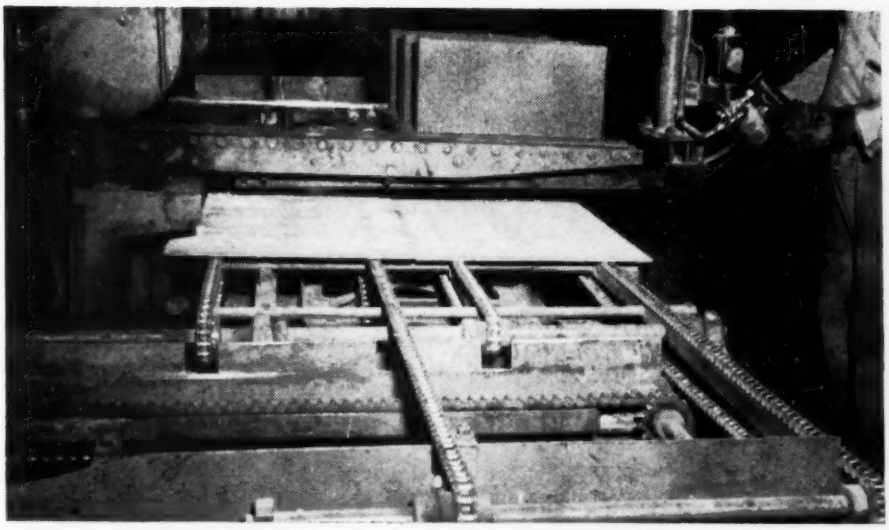
Gravity Flow of Materials

Cleveland Builders Supply Co. located the block plant on land adjacent to one of its operating brick yards and in an excavated area that had formerly been a gravel pit. With the plant located in an excavation, gravity flow of materials is possible, and both bulk cement and aggregate are dumped from trucks directly into overhead bins. Trucks back over a 50-ft. long ramp extending from the top of the cut-bank. Two grades of Celocrete, from ¼- to ½-in., and minus ¼-in., are used, with total storage capacity provided for 150 tons. A 10-ton capacity bin is also available for lake sand, which is used occasionally in special mixes. Bulk air-entraining portland cement is stored in a 45-ton capacity bin. Like other concrete product manufacturers, management at the Hugo plant finds it impossible to obtain adequate cement from one source, but the bin is always emptied before a different brand is added: at no time are cements from different sources mixed.

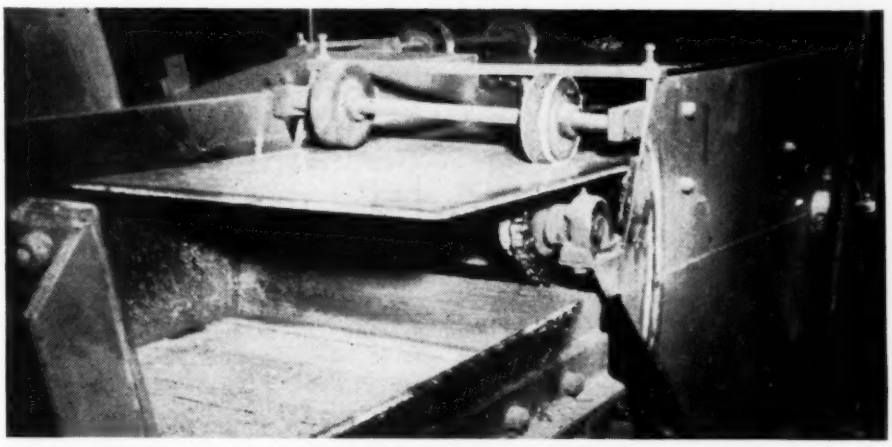
All overhead bins are of Blaw Knox manufacture, providing for gravity flow of material to a traveling weigh lorry, which is self-powered by an electric motor. The Butler lorry is controlled by limit switches which spot it accurately under desired bins or over any one of three Stearns 50-cu. ft. mixers. Lorry and mixers are mounted on a mezzanine floor over the block machines. Mixer gates open to discharge to 76-cu. ft. feed hoppers mounted over each machine. Both the inside of the tub as well as the blades of the mixers are specially treated with Coast-Metals hard-surfacing welding rod to lessen wear. An interesting feature of the mixing floor operation is the provision of a steam blanket over the mixers, which is formed from a series of nozzles that atomize the steam, effectively minimizing dust.

Develop High Capacity Off-Bearer

With installation of higher capacity machines it became necessary to off-bear more than the usual one pallet per time. In answer to this problem, an off-bearer was developed that has slight resemblance to its predecessor of a few years back. It not only is capable of taking two pallets (six 8- x 8- x 16-in. block) from the machine at one time for transfer to the curing rack, but it has five finger-tip control buttons mounted on the operators hand grip. Two buttons, for raising or lowering the hoist, are a common practice; but a third enables the hoist operator to stop the block machine by remote control; the fourth activates electric motors controlling the turntable on which the kiln racks are spotted in front of each machine; and the fifth button controls a magnet in the off-bearer arms that return empty pallets to the machine from the rack.

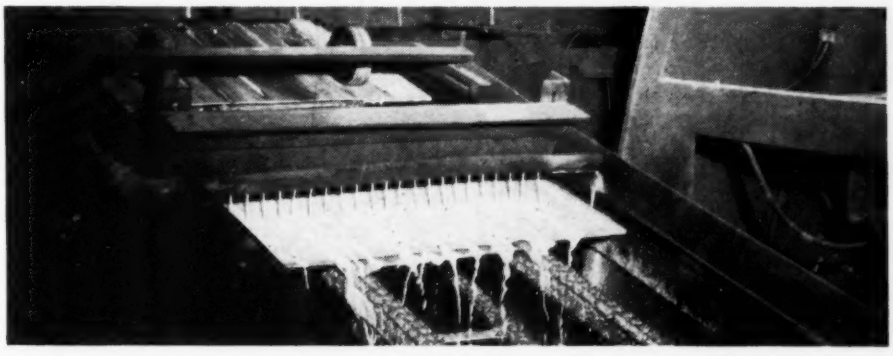


Two 42-lb. pallets just after being released from off-bearer which is now ready to remove two more pallets from machine. Note chain on which empty pallets are returned to back of machine



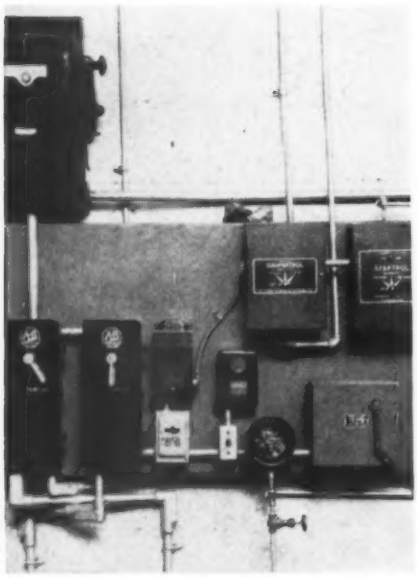
Pallet ready to drop from pallet-return to stack at back of machine, ready for feeding

All pallets in this plant are of steel and weigh 42 lb., but no worker fatigue is involved by this heavy pallet as no worker needs handle them. When a kiln rack is spotted on the turntable, pallets are in place with only the block having been removed at the cubing station. Waste air from the hoist is used to blow excess loose concrete from the top of two pallets before the bottom side of the off-bearer arms are clamped to them by electro-magnets carried in its tynes. Two pallets, weighing a total of 84 lb., are carried from the rack to the machine by a mechanism using the same air-hoist principle that removes block from the machine. As the off-bearer is placed in position under two loaded pallets resting on the gravity rollers of the block machine, preparatory to transferring them to the kiln rack, the magnet is released, allowing the empty pallets returned from the rack to drop to a chain carrier. This is a continuous process; as two loaded pallets are placed on the kiln rack, the operator lowers the off-bearer and picks up two empty pallets, return-

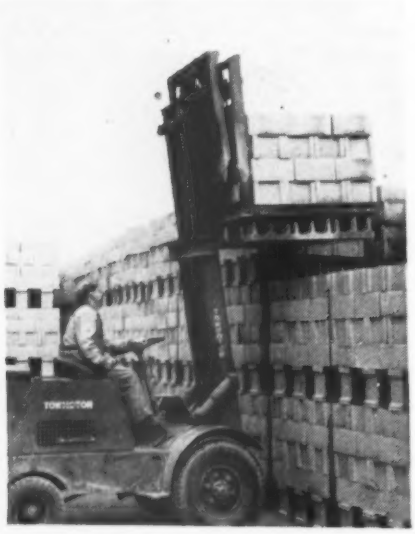


Pallet being elevated by pallet-return mechanism at oil-bath point

Truck dumping aggregate to overhead bin



Control panel in the boiler room



Placing "cubed" block in yard storage. Note method of cubing to aid in air circulation

Traveling weigh lorry for charging three 50-cu. ft. mixers

ing them to the machine at the same point where the next two loaded pallets are waiting to be transferred to the rack.

The chain carrier, in constant motion, moves pallets to a second chain carrier running along one side to the back of the block machine. As the pallets are transported by this second carrier, they are elevated and pass first a scrubber brush, revolving in the opposite direction from pallet movement, and from thence they pass through an oil-spray bath. At the back of the machine, pallets fall from the chain carrier and are stacked, ready for automatic feed to the block machine. Several outstanding advantages of this means of pallet return are no worker fatigue through pallet handling; ability to use common metal pallets; and a saving of one or more men per machine in pallet handling.

Curing System

Two LT-62 Towmotor fork trucks are in constant service inside the plant, carrying racks to the machine turntables or transferring loaded racks from machines to kilns. Eight kilns of 2500 block capacity each are provided, constructed with 8- x 8- x 16-in. solid lightweight aggregate block. Roofs are formed with a built-up roof over a concrete slab. Kiln doors, of aluminum sheeting, are not hinged, but rather are removed entirely by means of a "plate glass" type carrier when the kiln is to be opened. Management feels that this system, which prevents the doors being bumped or twisted out of line by passing trucks, is well worth while in that it aids in maintaining perfect alignment. Doors are clamped in place over a rubber gasket with a device about half-way up the door on either side. This clamp device, when released, automatically raises the door about 2-in., allowing the plate glass carrier to be slipped underneath. This system cuts out all maintenance costs, according to Mr. Ehle.

One thermocouple is permanently located on a wall half way back in each kiln, at a level with the top block in a rack. Four additional thermocouples are supplied for special test points from which heat readings may be desired from time to time. These were particularly useful when extensive tests were being run to determine the most advantageous curing cycle at this particular plant. All thermocouples are connected to a Brown Potentiometer in the plant office of Ralph Reiner, plant superintendent. In normal operation, only the one thermocouple in each kiln is registering on the continuous graph paper of the potentiometer, with changes from each kiln to the next being automatic, two minutes allotted to each kiln in sequence. When a kiln heat is noted as being high or low as recorded on the potentiometer graph, the steam flow is controlled manually.

Curing cycle at this plant is as follows: Block are allowed two hours setting time in the kilns before steam is turned on. Temperature is brought up to 182 deg. F. at a speed not to exceed one degree per minute, after which time block are allowed to soak

(Continued on page 134)

Showing how gripping forks hold cubed block

Design and Control of

PUMICE CONCRETE MIXES

By WALTER K. WAGNER*

PUMICE has many uses. As an aggregate it was used by the Romans over 2000 years ago in the construction of many public buildings. It is only recently, however, that it has been used extensively as a lightweight concrete aggregate with any semblance of scientific design or control. At first, mine-run pumice was used without regard to grading or purity. Until about 1946 practically all of the local commercial aggregate was used in the manufacture of pumice blocks, the quality of which was as questionable as the materials that went into them. Even the same mix, with materials that were supposedly from the same source, showed such variations in strength that it was believed for a time that uniformity of quality was impracticable if not impossible to achieve.

In October, 1946, the Pumice Aggregate Sales Corporation was formed to develop and promote the uses of pumice aggregate through a concerted program of testing and research. After less than two years, enough information has been gathered to prove that it can be used successfully as a lightweight aggregate for structural concrete.

Analysis of Material

Pumice is an inert material, therefore, it has no reaction with any of the ingredients of concrete nor with the steel in reinforced sections. Its loose weight, in damp condition, is from 950 to 1250 lbs. per cu. yd., depending on grading of the material. It has a fusion point of about 2500 deg. F.

Following is a typical chemical analysis:

Silica (SiO_2)	70.28%
Alumina (Al_2O_3)	13.54
Titania (TiO_2)	0.26
Ferric Oxide (Fe_2O_3)	2.06
Manganese Oxide (Mn_3O_4)	0.30
Lime (CaO)	1.96
Magnesia (MgO)	0.88
Potash (K_2O)	3.33
Soda (Na_2O)	4.14
Loss on Ignition	3.73
Total	100.48%

Most block manufacturers are using a "blended" material graded from coarse to fine because it necessitates handling only one aggregate. The material is available in two sizes, however, where the consumer desires to blend the aggregates to suit his requirements.

Since May 21, 1948, the Albuquerque Gravel Products Co. has been producing ready-mixed "Pumicrete" in the Albuquerque area. Mixes are designated by 28-day compressive strengths and vary from 250 p.s.i., a very lean pumice fill, to structural concrete with compressive strengths to 3500 p.s.i.

Material purchased from the Pumice Aggregate Sales Corporation and delivered by rail from its plant at Domingo, about 37 miles north of Albuquerque, is received in two sizes and stored separately in large silos. Such storage reduces moisture changes to a minimum and prevents the excessive segregation of fine and coarse particles which generally results when the material is stored in large, open stockpiles.

Because the material is mined and screened in a damp condition, a small amount of the very fine size clings to the larger particles. This accounts for the high percentage of minus No. 200 material shown for the coarse fraction.

Both sizes have high water absorption factors which are almost completely satisfied as the material is received, thus eliminating presaturation. The moisture content is also fairly constant allowing more uniformity in batching operations. Fig. 1 shows the relationship between particle size and specific gravity and absorption. It is obvious that slight changes in grading could affect important changes in the overall specific gravity and absorption of the material. For this reason, uniformity of gradation is necessary in order to obtain consistent results in batching and control of Pumice concrete. Based on factors shown in Fig. 1, if the grading of fine pumice varied from one extreme to the other as established by A.S.T.M. limits for lightweight concrete (See Table I), the bulk specific gravity, saturated surface dry, would vary from 1.95 for the fine limit to 1.60 for the coarse limit. Absorption by dry weight would vary from 18.0% for the fine limit to 29.8% for the coarse limit.

Table I shows a typical analysis of the material as received:

TABLE I—PERCENTAGES PASSING BY WEIGHT

Sieve Size	A.S.T.M. C 130-42 Coarse ½ in. to No. 8	A.S.T.M. C 130-42 Fine ¼ in. to dust	Material As Received Coarse	Material As Received Fine
½ inch	100		100.0	
⅜ inch	85–100	100	96.5	100.00
No. 4	0–20	95–100	18.5	97.5
No. 8	0–5		6.0	76.7
No. 16		45–80	5.6	48.7
No. 30			5.6	25.4
No. 50		10–30	5.3	15.5
No. 100		5–15	5.3	10.8
No. 200			4.2	8.0
			Material As Received Coarse	Material As Received Fine
Fineness Modulus (by weight)			5.572	3.254
Fineness Modulus (by absolute volume)			5.802	3.727
Bulk Specific Gravity (saturated, surface dry)			1.23	1.64
Absorption (% by dry weight)			47.8	27.3
Approx. Unit Weight—lbs. per cu. ft.			36	47
Approx. Moisture as received (% by dry wt.)			40	25

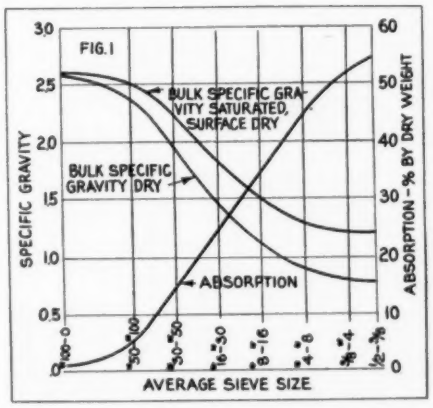


Fig. 1: Relation of grain size to specific gravity and absorption

It is difficult to believe that such major changes in grading might occur, but experience has shown that grading is the most important control problem. It will affect consistency, unit weight, and yield of the mix.

Table II shows values for specific gravity and absorption for each parti-

*Engineer, Albuquerque Gravel Products Co.

Introduction

• Pumice is a porous glass froth. It was formed from rock fragments thrown into the air from active volcanoes. The sudden expansion of gases within the rock structure and rapid cooling trapped tiny bubbles of gas that caused it to remain as a sponge-like, but tough and durable material. Thus, nature did for Pumice what man has since done for materials such as Haydite, Perlite, and Vermiculite.

Since Pumice is of volcanic origin, it is found only in those localities where volcanoes have been active. In the United States the larger and purer deposits are found in New Mexico, California, Oregon, Washington, and Idaho.

TABLE II—COARSE PUMICE FROM TABLE I

Sieve Size	% Passing by dry weight	% by dry wt. Pass.	Ret.	% Ea. Size by dry weight	Absorption Ea. Size % by dry wt.	Weight Ea. Size S.S.D.	Bulk Sp. Gr. S.S.D.	Absolute Vol. Ea. Size S.S.D.	% Ea. Size by Abs. Vol.	Accumulative % Retained by Abs. Vol.
½	100.0	½" —	⅜	3.5	55.0	5.4	1.20	4.5	3.8	
⅜	96.5	⅜" —	No. 4	78.0	51.5	118.1	1.21	97.6	82.2	3.8
No. 4	18.5	No. 4 —	No. 8	12.5	45.0	18.1	1.29	14.0	11.8	86.0
8	6.0	8 —	16	0.4	35.0	0.5	1.51	0.3	0.3	97.8
16	5.6	16 —	30	0.0	25.0	0.0	1.83	0.0	0.0	98.1
30	5.6	30 —	50	0.3	14.5	0.3	2.24	0.1	0.1	98.1
50	5.3	50 —	100	0.0	5.5	0.0	2.51	0.0	0.0	98.2
100	5.3	100 —	0	5.3	1.0	5.4	2.61	2.1	1.8	98.2
				100.0		147.8		118.6	100.0	5.802

Calculated absorption = by dry weight % $\frac{147.8 - 100.0}{100.0} \times 100 = 47.8\%$

Calculated bulk specific gravity, saturated, surface dry = 147.8/118.6 = 1.246
Fineness Modulus by absolute volume = 5.802

FINE PUMICE FROM TABLE I

⅜	100.0	⅜ —	No. 4	2.5	51.5	3.8	1.21	3.1	3.9	
No. 4	97.5	No. 4 —	No. 8	20.8	45.0	30.2	1.29	23.4	29.8	3.9
8	76.7	8 —	16	28.0	35.0	37.8	1.51	25.0	31.8	33.7
16	48.7	16 —	30	23.3	25.0	29.1	1.83	15.9	20.2	65.5
30	25.4	30 —	50	9.9	14.5	11.3	2.24	5.1	6.5	85.7
50	15.5	50 —	100	4.7	5.5	5.0	2.51	2.0	2.5	92.2
100	10.8	100 —	0	10.8	1.0	10.9	2.61	4.2	5.3	94.7
				100.0		128.1		78.7	100.0	3.727

Calculated absorption % by dry weight = $\frac{128.1 - 100.0}{100.0} \times 100.0 = 28.1$

Calculated bulk specific gravity, saturated, surface dry = 128.1/78.7 = 1.628
Fineness modulus by absolute volume = 3.727

cle size for both coarse and fine pumice. These values are computed from the typical analysis in Table I and the factors from Fig. 1. Calculated values of specific gravity and absorption for both coarse and fine agree very closely with those obtained by actual tests on composite samples.

Mix Design

In December, 1947, a series of mixes was started by the Civil Engineering Department of the University of New Mexico under the supervision of Prof. W. C. Wagner, Head of the Department, in an effort to determine strength relationships in mixes of workable and plastic consistencies.

It was found from these tests that pumice concrete follows the water-cement ratio law as accurately as ordinary concrete as long as a proper balance is maintained between coarse and fine.

Aside from the plain pumice mixes, others were made in which ordinary concrete sand was substituted for a portion of the pumice fines. The addition of concrete or plaster sand improves the workability and strength of pumice concrete in some of the leaner mixes, but a subsequent increase in unit weights is also effected. Although the greater unit weights are not objectionable in some structural concrete, lighter weights are desirable where insulation is important.

From the results of over 500 6 x 12-in. cylinders representing 85 mixes made by the University of New Mexico, and a great number of field check tests, water-cement ratio curves have been established for local aggregates. The curves for mixes with and without natural sand are shown in Fig. 2.

Fig. 3 gives water requirements in pounds (or gallons) per cubic yard of concrete necessary to produce workable mixes of approximate 4-in. slump.

These curves were also developed from the series of tests mentioned previously and apply only to aggregate alike or similar in characteristics to those used in the mixes. The curves presented herewith are for mixtures without admixture, and are based on the assumption that no air is entrapped. Pumice concrete has a high tendency to bleed, especially in the leaner mixes, and so an admixture is desirable to reduce bleeding and increase workability. Pozzolith is found to be an ideal admixture for this purpose. Aside from an overall benefit to the mix, Pozzolith will allow a water reduction of approximately ten per cent. The same water-cement ratios will apply, thus a considerable saving in cement can be effected through the use of this admixture.

Although the slump test, at the present time, is the only practical field method of measuring the consistency of other types of concrete, it is not a reliable measure of relative consistency in pumice concrete. Mixes with relatively high cement factors can be controlled by the slump test, but in the leaner mixes, water can best be controlled by observation. Pumice concrete, because of its lighter weight can be handled as a much stiffer mix than ordinary sand and gravel concrete.

The water curves in Fig. 3 present an interesting relationship in that they are not straight lines as is sometimes suspected. The "dip" in the curves, showing minimum values between water-cement ratios of 0.5 to 0.7 (by weight), is typical of any series of mixes wherein the sand to total aggregate ratio is kept in balance to produce mixes of relative workability. In curves for ordinary concrete, this minimum point will shift to the right slightly as the maximum size of aggregate is increased. This is due to lower fine aggregate requirements of the larger aggregate.

Because of the difference in specific gravities of fine and coarse pumice, it was believed that a method of proportioning by absolute volume would be more efficient than other methods

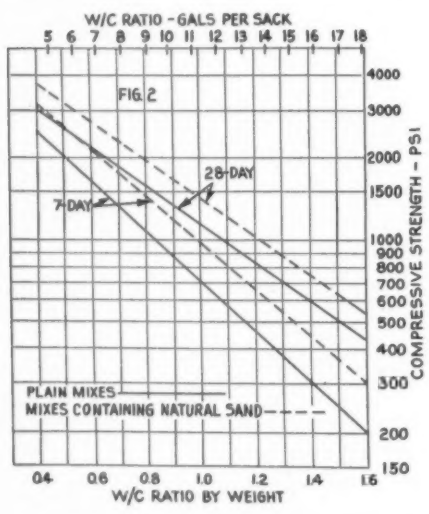


Fig. 2: Water-cement ratio curves for pumice mixes

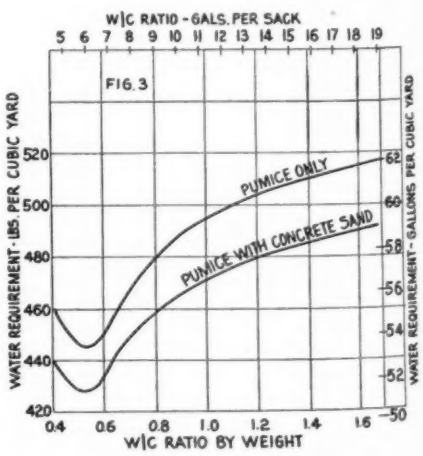


Fig. 3: Relation of W/C ratio to water requirements for plain pumice mixes and mixes containing concrete sand

involving unit weight and void determinations. A modification of the Fineness Modulus Method[2] adapts itself admirably to the design of pumice mixes. The method will be described here briefly.

In any series of mixes, from rich to lean, wherein the same or similar aggregates are used, relative workability can be achieved if the fineness modulus of total solids (by absolute volume) in the mix is kept a constant. That is, the absolute volume of cement is included in the fineness modulus calculations. The following nomenclature is used:

Ma—fineness modulus of total aggregate by absolute volume
Mc—fineness modulus of coarse aggregate by absolute volume
Mf—fineness modulus of fine aggregate by absolute volume
Ms—fineness modulus of total solids by absolute volume
Va—absolute volume of total aggregate
Vs—absolute volume of total solids
R — per cent fine to total aggregate by absolute volume

Cement is assumed to have a fineness modulus of zero, therefore the fineness modulus of total solids is always a lesser value than that of the total aggregate. The fineness modulus of total solids, *Ms*, can be determined from the sieve analysis (by absolute volume) of the aggregates and the percentages of fine and coarse aggregates and cement in the mix. A simpler method is to determine the fineness modulus of total aggregate from the respective fineness modulus of each and its proportion of total aggregate in a workable mixture and then determine the fineness modulus of total solids from the expression

$$Ms = Ma \frac{Va}{Vs}.$$

After *Ms* is determined from one or more mixes, the value may be used to set up other mixes from lean to rich within practical limitations. An example might best demonstrate its application.

Suppose that a trial batch revealed that the following proportions of materials produce a cubic yard of concrete of the desired workability and consistency:

	Wt. lbs.		Bulk Sp. Gr.		Unit wt. of water		Abs. vol. cu. ft.
Water	484	÷	1.0	×	62.4	=	7.753
Cement	579	÷	3.15	×	62.4	=	2.947
Fine Pumice	1131	÷	1.64	×	62.4	=	11.054
Coarse Pumice	403	÷	1.23	×	62.4	=	5.246
Totals	2597						27.000

The cement factor is 6.17 sacks per cubic yard and the water-cement ratio by weight is 484/579 = 0.835. The ratio of fine to total pumice, by absolute volume, is $\frac{11.054}{11.054 + 5.246}$ = 67.82%. The absolute volume of total aggregate, *Va*, is 11.054 + 5.246 = 16.300, and the absolute volume of total solids, *Vs*, is 16.300 + 2.947 = 19.247.

Fineness modulus values by absolute volume for coarse and fine are shown in Table II as 5.802 and 3.727 respectively.

The fineness modulus of total aggregate, *Ma*, then is

$$(3.727 \times .6782) + [5.802 \times (1.000 - .6782)] = 4.395$$

and the fineness modulus of total solids is

$$Ms = Ma \frac{Va}{Vs} = 4.395 \times \frac{16.300}{19.247} = 3.722$$

Suppose now, that a mix is desired having a 28-day strength of 2500 p.s.i. From Fig. 1 for plain mixes, a water-cement ratio of 0.525 is required. From Fig. 2 a water-cement ratio of 0.525 indicates a water demand of 445.5 lbs. or 53.48 gal. per cu. yd. of concrete. The cement factor is then 445.5/0.525 = 848.6 pounds or 9.03 sacks. The absolute volume of water is 445.5/ (1.0 x 62.4) = 7.139 cu. ft. and that of the cement is 848.6/ (3.15 x 62.4) = 4.317 cu. ft. Since no air is assumed in the mix, the absolute volume of total solids is 27.000 — 7.139 = 19.861 cu. ft., and the absolute volume of total aggregate is 19.861 — 4.317 = 15.544 cu. ft.

The fineness modulus of total aggregate, *Ma*, for this particular mix is then found from the relation

$$Ma = Ms \frac{Vs}{Va} = 3.722 \times \frac{19.861}{15.544} = 4.756$$

and the percentage of fine to total aggregate, *R*, can be found from the expression

$$R = \frac{Mc - Ma}{Mc - Mf} \times 100 = \frac{5.802 - 4.765}{5.802 - 3.727} \times 100 = 50.40\%.$$

The absolute volume of fine aggregate is *R* x *Va* = .504 x 15.544 = 7.834 cubic feet, and the absolute volume of coarse aggregate is 15.544 — 7.834 = 7.710 cubic feet.

Thus, all factors have been determined and the mix may be set up as follows:

	Abs. Vol. cu. ft.		Bulk Sp. Gr.		Unit wt. of water		Wt. lbs.
Water	7.139	×	1.0	×	62.4	=	445.5
Cement	4.317	×	3.15	×	62.4	=	848.6
Fine Pumice	7.834	×	1.64	×	62.4	=	801.7
Coarse Pumice	7.710	×	1.23	×	62.4	=	591.8
Totals	27.000						2687.6

If concrete or plaster sand is substituted for pumice fines, the same procedure can be followed. In that case a minimum amount of concrete or plaster sand should be used in order to obtain the desired workability. After the proper ratio of sand to total fines is established, this ratio should be maintained in all other mixes containing sand. In other words, the fineness modulus of total fine aggregate should be held constant. In the mix data from which Figs. 2 and 3 were drawn, a concrete sand having a fineness modulus of 2.50 was used in the ratio of 40.4% by absolute volume of total fine aggregate. Such a combination produced a nicely graded fine aggregate with a fineness modulus of about 3.231 by absolute volume. Compared to a fineness modulus of 3.727 for pumice fines only, the reason is apparent for the increased workability of mixes containing natural sand.

Air Content

The mixes discussed herein have been assumed to be air-free. This is certainly not the case even in pumice concrete containing no admixture. In a series of six mixes, varying from rich to moderately lean, made and tested by the University of New Mex-

(Continued on page 136)

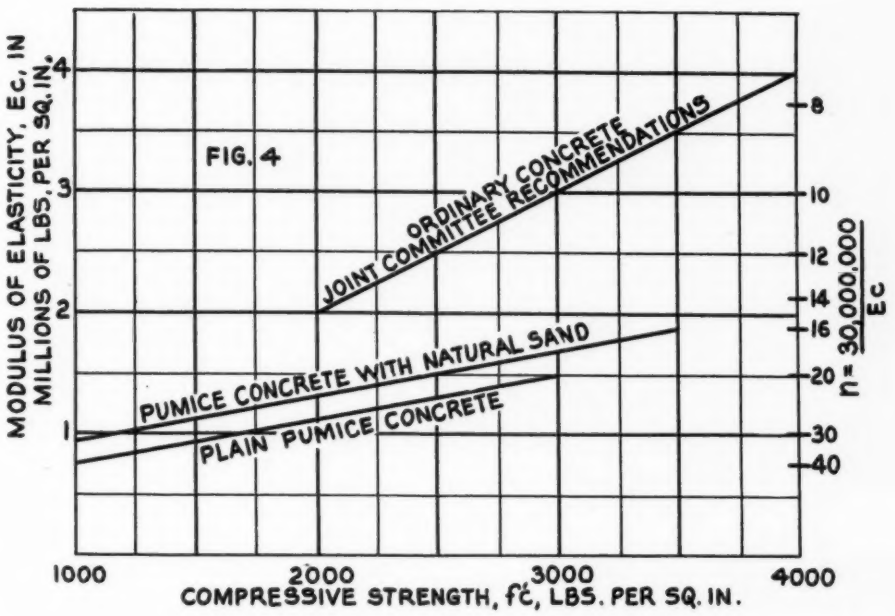


Fig. 4: Relation of modulus of elasticity to compressive strength

Members and their families attending the summer meeting of the Concrete Products Association of Washington

Washington Concrete Products Ass'n. Meeting

CHEVY CHASE INN, Port Townsend, was host for the Nineteenth Annual Meeting of the Concrete Products Association of Washington, held June 25-26. The directors' meeting took place Friday evening, and the regular program was held Saturday forenoon with the remainder of the time being devoted to golfing, sailing, and tennis.

Highlight of the Saturday program was a report by J. J. Wegner on the Pumice Research Program being conducted by Washington State College at Pullman. W. G. Kaiser, manager, Farm Bureau, Portland Cement Association, Chicago, Ill., spoke on "Building Better Markets for Concrete Block," and led a discussion on Concrete Products.

The following officers were elected: George P. Duecy, Associated Sand & Gravel Co., Everett, president; A. B. Metcalf, Columbia Concerte Pipe Co., Wenatchee, vice-president; Talbot Campbell, Seattle Concerte Pipe Co., Seattle, secretary-treasurer; and H. C. Lutes, Layrite Concrete Products, Spokane, director at large. Thomas P. Nash, Bellingham Builders Supply Co., Bellingham, retiring president, was made a director.

Opens Block Plant

BASIC CONSTRUCTION MATERIALS Co., has opened a new $120,000 concrete block plant at Chillicothe, Ohio, composed of several individual block plants, the Southern quarries and the Transit Mix Concrete Co. Capacity will be 6000 block per 8-hr. day using a Besser Super Vibrapac machine.

Robert Coe is the Chillicothe manager of the Basic Construction Materials and associated with him are: Travis Rinehart, ready-mix superintendent; Kenneth Cooper, block plant superintendent; Monroe Harper, traffic manager; Bill Rodgers, sales manager; and John Wetzel, gravel plant superintendent.

N.C.M.A. Officials Tour Florida

OFFICIALS of the National Concrete Masonry Association recently completed a two-day inspection tour of Southern Florida home construction and manufacturing as part of a nation-wide tour of the country's larger concrete block plants and distribution yards. Members of the group included George Katterjohn, president of N.C.M.A.; Glenn Barnes, vice-president; and E. W. Dienhart, executive secretary.

Mr. Katterjohn said the group was impressed with construction in the area and was especially interested in Florida development of corner and beam blocks to eliminate the use of forms and the use of exposed masonry with new type blocks. Mr. Dienhart said that concrete block construction is 100 percent above the 1941 level on a national average, with Florida regarded as the leading user of this type of material in the country, on a per capita basis.

M. E. Rinker, Jr., president of Rinker Materials Corp., West Palm Beach, was host to the delegation. Purpose of the tour is to develop new and improved uses for concrete masonry.

Concrete Slab Producers Meet in Oshkosh, Wis.

MO-SAI ASSOCIATES, New Haven, Conn., producers of architectural concrete slabs, held their annual meeting July 16-19 in Oshkosh, Wis. During the business sessions it was decided by the group to prepare a catalog for distribution among architects, contractors, engineers, etc., the catalog to contain technical data and drawings, photographs, imaginative structures, specifications, and cover handling of the architectural slabs.

A round table discussion was conducted on fabrication problems and covered improved methods of constructing forms, casting, loading trucks, and efforts to achieve uniform results as to appearance of Mo-Sai. The next meeting is scheduled to be held in Salt Lake City, Utah. Edward Olson, president, Badger Concrete Co., Oshkosh, was host to the group.

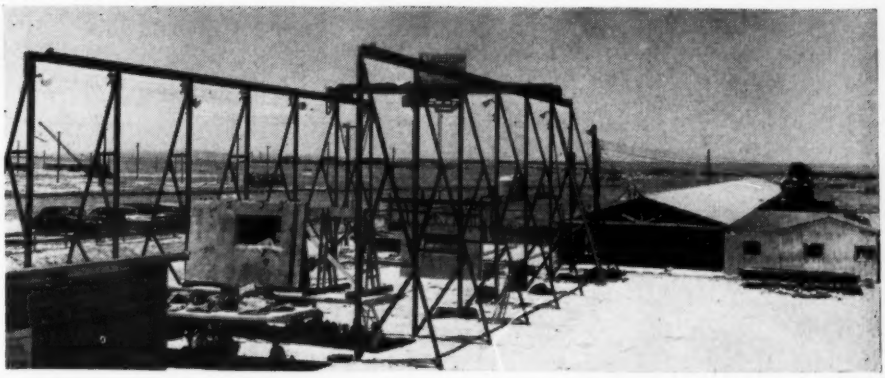
Officers of Washington Concrete Products Association for 1948 and 1949. Left to right: vice-president, A. B. Metcalf, Columbia Concrete Pipe Co., Wenatchee; C. M. Howard, engineer, manager, Seattle; director, Thos. P. Nash, Bellingham Builders Supply Co., Bellingham; secretary-treasurer, Talbot Campbell, Seattle Concrete Pipe Co.; director, Layrite Concrete Products Co., Spokane; and president, Geo. P. Duecy, Associated Sand & Gravel Co., Everett

Conduct Tours Through Cement Plant

COLUMBIA CEMENT Co., Zanesville, Ohio, recently conducted a series of tours for employes' families and friends, through the cement plant to enable them to see how the cement is manufactured, and under what conditions the employes work.

Prefabricated Housing of Pumice Concrete

E. S. McKittrick Co., Inc., making precast sections for Haddock Engineers, Ltd., housing project near Albuquerque, N. Mex.



Overhead traveling crane used for stripping precast house sections and loading on trucks. In the background, to the left, is fabricating and precasting building, and to the right is the office. Mixer truck may be seen in far background, to the right.

IN the morning shadows of the Sandia Mountains near Albuquerque, N. M., prefabricated houses made from precast pumice concrete are coming off an assembly line factory at the rate of two per working day. So well co-ordinated are the operations that light weight pumice aggregate, which has lain undisturbed for centuries in the Jemez mountains some 50 miles distant, is transformed into a concrete house in a matter of a little over 48 hours. Methods used and quality of construction recently caused C. A. Clark[1] to state that they were the best precast houses he had seen.

Prime contractor on this project involving 152 two and three-bedroom houses is Haddock Engineers, Ltd., Oceanside, Calif., with Allan Holloway in charge of the New Mexico operations. The E. S. McKittrick Co., Inc., of Huntington Park, Calif., that developed this type of house, (See ROCK PRODUCTS, August, 1947, p. 206) has the sub-contract for all concrete work and handles the manufacturing and erection of the house "shells." A. V. Roemisch is project superintendent for the McKittrick Co., and also has had a hand in developing this type of construction. This is not a "guinea pig" project, as this company has built hundreds of similar houses in California, notably for the Navy at Inyokern[2].

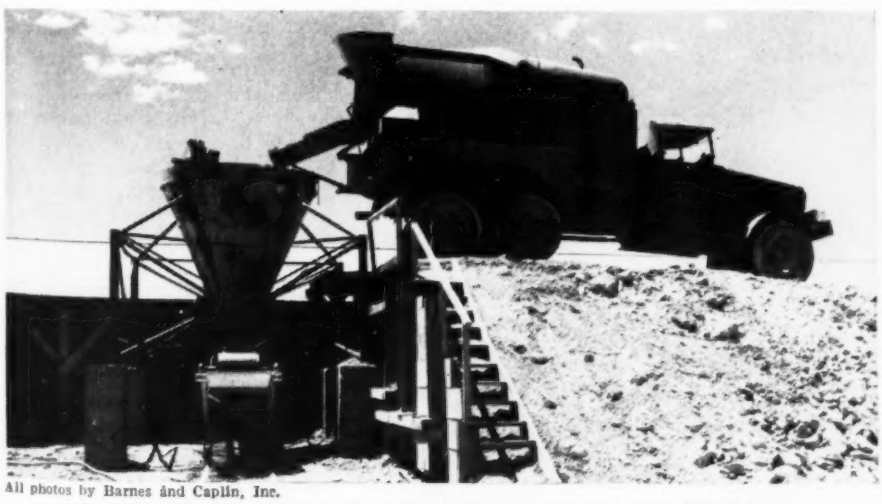
Lightweight pumice concrete, from "Pyramid" pumice supplied by Pumice Aggregate Sales Corp., is delivered ready-mixed by Albuquerque Gravel Products Co. Control facilities of the latter company have resulted in uniform concrete relieving the contractor of the burden of setting up and operating a mixing plant with its attendant problems in keeping the mix adjusted. A five-sack mix, using an admixture of Pozzolith to reduce unit water content and bleeding, has been controlled to a slump of 1¼-in. ± ½-in. Mr. Roemisch states that government tests of 6 x 12-in. cylinders, which were sent through the steam tunnel on one of the tables, have shown strengths as high as 1510 p.s.i. at 24 hours, with average of 7 day tests—approximately 1800 p.s.i. and 28-day, 2200 p.s.i. Normal Portland cement is used, but in order to get the slabs into the steam tunnels as early as possible, an accelerating admixture of 75% Ca Cl_2 is used on the day pours and 1.0% on the night pours.

Assembly Line Plant

The assembly line plant of this "house factory" occupies a piece of land 220- by 640-ft. The house sections are cast on steel tables which move along on a track through a 380 ft. building. The tables are cleaned and sprayed with liquid soap, edge forms of channel iron placed to outline the size and shape of a wall or roof section, steel door and window frames set in place, electrical conduit and plumbing properly located, and reinforcing steel placed as the tables move through the first half of the building. When a table reaches the center of the building, a traveling-frame conveyor belt brings the pumice concrete from an outside hopper of 6 cu. yd. capacity which is kept filled by transit-mix trucks. One man operates the travel of the conveyor, starts and stops the belt, opens or closes the discharge gate of the hopper, and when required, starts a vibrator on the hopper to keep concrete feeding—all from one point through remote controls. Two other men at this point keep the concrete struck to rough grade with rakes till the table is filled and then make one pass over it with a vibrating screed which gives it the final strike-off and consolidates the concrete which is held to a very stiff consistency.

As soon as the vibrating screed has made its pass, a close coupled "tractor," made from a cut-down Ford V-8, couples onto the table and moves it on down to the far end of the building where cement finishers put the finishing touches on the exposed surface. The tables are then transferred to either of two outside tracks which lead into the steam curing tunnels. As soon as one tunnel is loaded, the doors are closed and steam turned on.

After six hours of steam curing at 170 degrees F., the opposite end of the tunnel is opened and the tables are drawn out by a power hoist cable. Edge forms, boxes around windows, etc., are removed and the table is moved over a hydraulic lift which tilts the complete table assembly into a vertical position. Eye bolts are screwed into inserts, and an overhead crane lifts the slab away from the table and places it on a rack mounted on semi-trailers. The table is then lowered and moves back into the building to be cleaned and re-used.



All photos by Barnes and Caplin, Inc.

Transit mixer backing up ramp and discharging its load into cone shaped hopper over conveyor belt

Belt conveyor on overhead track moves concrete from receiving hopper to tables where it is spread to rough grade. Concrete is then struck off with a vibrating screed before table moves on to the hand finishing operation and thence to steam curing tunnels

How Sections Are Erected

The rack on which the wall panels are loaded is padded with sponge rubber and sponge rubber pads are used between slabs. Roof sections are handled in a horizontal plane and are cushioned on old rubber tire casings covered with burlap. As soon as a trailer is loaded, a truck tractor backs under it and moves it to the location where the slabs are to be erected, leaves the loaded tractor and returns with an empty one.

Sections are made and loaded on the trailer in proper sequence so that they are removed from the load in the order required in the erection operation. A heavy Koehring truck crane lifts the sections from the trailer and sets them in final position.

Lifting eyebolts are screwed into a coupling nut on a thrush-bolt which extends through the wall section to the bottom edge where another coupling nut is provided. These rods are spaced approximately 4-ft. apart. Before lowering a wall section into position, machine bolts are screwed into the lower coupling nuts to act as leveling screws. In final position the heads of these machine bolts rest on steel plate inserts cast into the concrete footing and are welded to the plates to anchor the walls to the footing.

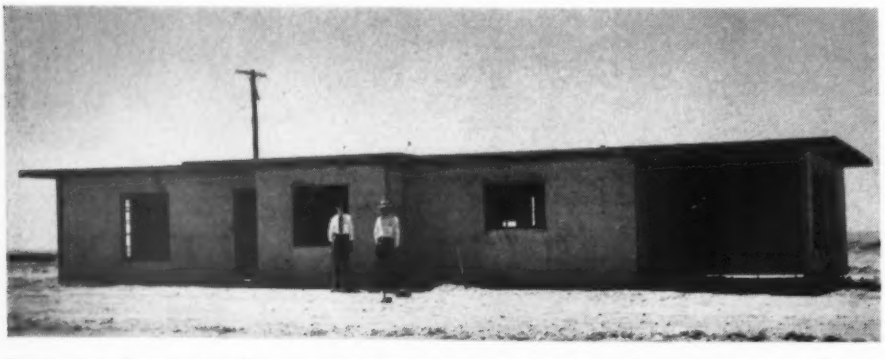
Later, when the roof panels are set, conical holes in the roof slabs are positioned over the through rods, and another machine bolt is screwed into the upper coupling nut. The inverted conical hole is grouted full and, in effect, the roof slab is bolted through the wall into the footing.

Wherever two wall panels butt together, metal inserts left exposed at the top of the wall are arc welded together to give a continuous tie at the top of the wall. Similar inserts are found in the roof sections, and, when welded, give a rigid tie between roof slabs.

Sponge rubber strips are placed along the top of the walls to cushion the roof slabs and to form a moisture seal. Vertical joints between wall sections are caulked with a pressure gun. A built-up roof with tar and gravel finish is used with an aluminum stop around the edge to trim it up.

When the underfloor plumbing and electrical work have been installed, a rough subfloor of ordinary concrete is poured. Wood sleepers of asphalt treated 2- x 2-in. are anchored in place to receive a wooden subfloor over which a finished oak floor is placed. The base slab of concrete is given a water proofing treatment prior to laying the wooden floor. The concrete slab extends under the bottom of the wall section to fill the space left for adjusting the leveling screws, resulting in a full bearing under the walls.

While these houses are being built on a government project, there has been considerable interest shown by local people, and the contractors should have little trouble in marketing the house locally, should they elect to do so upon completion of the present contract. Considerable flexibility exists in the system so that a variety of arrangements might be employed. Various architectural treatments could be used to vary appearance.



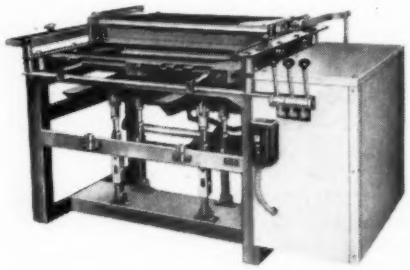
Front view of precast pumice concrete house shell. T. Jack Foster, right, and son Jack of Pumice Aggregate Sales Corporation are standing in center foreground

[1] District Engineer, Portland Cement Association, Austin, Texas, whose paper on **Tilt-up Construction** appeared in the May, 1948 **Journal of the A.C.I.**

[2] **"Prefabricated Pumice Concrete Houses"**—H. L. Matthews, May, 1948—J.A.C.I.

Hydraulic Stave Machine

NEW MONARCH MACHINE AND STAMPING CO., Des Moines, Iowa has developed the Monarch hydraulically operated concrete silo stave machine. It makes a stave 30 in. long, 10 in. wide and 2½ in. thick. These staves are concave and convex, and permit the building of varied sizes of silos from 10 ft. to 30 ft. in diameter.



Silo stave machine is hydraulically operated

Using an hydraulic stave machine instead of the hand-operated saves the work of one man and removes all the manual labor from the job of making staves. As the hopper is moved forward and back hydraulically, the molds are opened and closed and the pallets raised and lowered hydraulically, thus eliminating all the hard labor and making it possible to produce up to 1200 staves per day.

ALVIN AND BIRD CULLUM have purchased two concrete block machines and a brick machine and will go into business at Unionville, Mo.

Design Plant For Pumice READY MIXED Concrete

Albuquerque Gravel Products Co., sets up special plant facilities to handle pumice concrete.

FOR over two years Albuquerque Gravel Products Co., has been furnishing ready-mixed Zonolite (expanded vermiculite) concrete in addition to regular sand and gravel concrete. This "featherweight" concrete has been used primarily for insulation purposes on roof decks where structural strength of concrete is not a factor.

Recognizing the need for a lightweight concrete which would develop strength suitable for structural uses as well as insulation, steps were taken in December last year which resulted in adding ready-mixed pumice concrete to the price lists, and since May 27, few working days have gone by without some pumice concrete in the pouring schedules. Months of testing and analyzing data on pumice from various sources preceded the release of an official price list on pumice concrete which carries 13 standard mixes all designed on a strength basis. Investigations indicated it would be difficult, if not impossible, to maintain satisfactory control of the mixes if "pit run" pumice were used. Aggregate finally selected was "Pyramid" pumice as supplied by Pumice Aggregate Sales Corp., as it was felt they were best equipped to furnish graded materials with a minimum of variation.

The plant was designed to handle two sizes of pumice aggregate; fine aggregate, ¼-in. to dust, and coarse aggregate, ½-in. to No. 4. Bulk storage of the pumice aggregate is handled in two steel silo tanks 13 ft. in diameter by 48 ft. high which were built locally in one piece, hauled to the plant on flat cars and erected with a crawler crane. Each silo provides a live storage of 200 cu. yd. plus approximately 25 cu. yd. dead storage which has come in handy a few times when carload shipments were delayed.

Rapid, Large Capacity Aggregate Handling Facilities

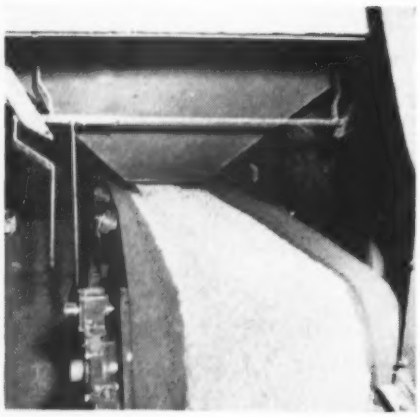
Pumice aggregate is received by rail, and an undertrack hopper 12- x 20-ft. makes it possible to handle either side-dump or center-dump cars. The pit is provided with sliding steel plate covers between the rails and hinged plate covers on the sides. When open to receive a car, the side covers act as a chute to guide material into the hopper. All four gates of a 100 cu. yd. car may be opened at once.

Floor level of the undertrack pit is 16-ft. below the base of the rail, and from the steel hopper, built within the pit, material flows onto a 30-in. conveyor belt which extends through

Water, cement, and natural sand are loaded into the truck mixers at main plant and mixed into a thin slurry as the truck moves about 300 ft. to the pumice plant

Pumice plant comprises two steel silos 13- x 48-ft., supported over the roof of the conveyor tunnel. A truck receiving hopper is provided between silos and driveway under plant for dump truck deliveries

Floor level of under-track pit is 16 ft. below base of rail. Material feeds from hopper onto a 30-in. conveyor belt



Transferring material from silos to batch plant bin through gates in the tunnel roof. Material flows into collecting hopper which loads 30-in. belt for feeding elevator

Turnhead on top of batch plant for loading either of the three compartments

At approximately 2-in. slump, no trouble was experienced in floating concrete. No sheen of bleeding is present in this mix which contained an admix

the tunnel under the silos and discharges into the base of a 75 ft. bucket elevator which employs 8- x 8- x 20-in. buckets on 18-in. centers bolted to 24-in., 7-ply belting. Gates through the tunnel roof into the silos discharge material into a collecting hopper which loads the same conveyor belt when material must be transferred from the silos to the batch plant. A truck receiving hopper is also provided which discharges directly into the elevator base.

A series of two-way flap gates at the top of the elevator permit discharge to be diverted to either of the two silos or to a rotary turnhead which loads either of the three compartments of the batch plant.

Batching Plant

For the batch plant proper a used Madsen Iron Works portable plant was utilized. The bin sides and partitions were extended to increase storage capacity, and the 2 cu. yd. scale hopper was enlarged to permit batching 6 cu. yd. loads. Because of the light weight of pumice aggregate, these changes did not overload either the scale unit or structural members, but made it necessary to set the plant on 7-ft. concrete walls in order to secure adequate clearance for the truck-mixer units. There is a total aggregate storage of approximately 525 cu. yd. including dead storage in under-track hopper.

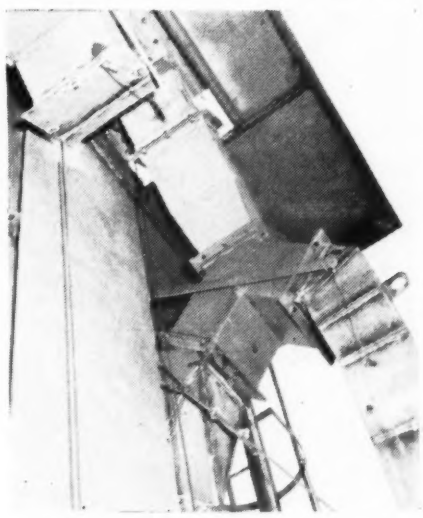
A new spur track was built so that six cars of pumice may be handled at one time without interfering with cars spotted on the cement track.

Water, cement, and natural sand, if required, are batched into the mixer drum at the main plant and mixes into a thin slurry as the truck moves about 300 ft. to the pumice plant. Pumice is introduced through tail end loaders with the drum revolving. This loading procedure has produced better results than loading the pumice first.

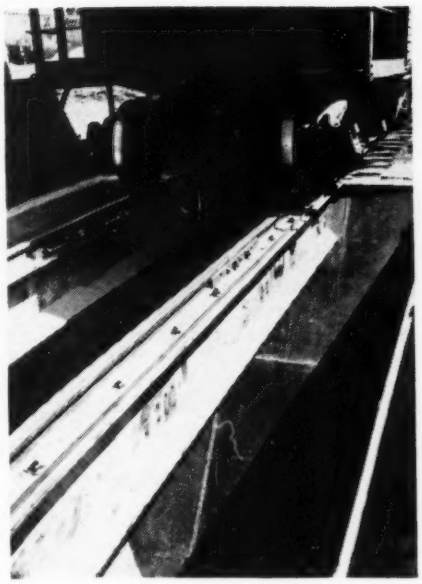
While no detailed study has been made regarding length of mixing time in the transit mixers, it does not appear to be much different than with ordinary concrete, and so long as the A.S.T.M. requirement that a minimum of 50 drum revolutions has been fulfilled before discharge, the concrete appears to be well mixed.

Moist Correction

The same control problems that confront a ready-mixed concrete operator apply in the case of pumice concrete. Proper corrections must be made for free moisture or for absorption in the aggregates. It has not been found necessary to presoak the aggregates as recommended by some authorities, but corrections are made for absorption when the moisture content is below saturated surface dry condition. Aggregate stored in the enclosed silos seems to maintain a more uniform moisture content than if it were exposed. Perhaps the most important control check is in the aggregate grading. Uniformity of grading is more essential than with sand and gravel concrete because changes in grading will change the overall specific gravities and upset the absolute volume yield calculations unless corrections are made. This is due to the fact that each size fraction has a different specific gravity. Minus 100-mesh material has a specific grav-



Looking up to top of elevator where a series of cable-controlled two-way flop gates permit the material to be discharged into either of the storage silos or spouted to a revolving turnhead on top of the batch plant



Cars of pumice aggregate shipped in by rail are spotted over an under-track hopper of 45-cu. yd. capacity

All photos by Barnes and Caplin, Inc.

First day pumice concrete deliveries were made, May 27, 1948. Gene Sundt may be seen to the extreme right

ity of 2.5 or more while particles coarser than ½-in. may have a specific gravity of 1.2 or less (saturated surface dry condition). Because of this wide difference, sieve analysis by weight should be converted to an absolute volume basis for determining the Fineness Modulus and particle distribution.

Most of the pumice concrete delivered so far has gone into precast pumice concrete houses being built for the government, but a number of large commercial buildings have employed it for roof deck construction, and a number of architects have expressed interest in using it also for structural purposes. Because of its insulative properties, pumice concrete walls will not sweat as ordinary concrete does.

Because of the reduced weight, workmen on the job find pumice concrete easier to handle. Wheelbarrows may be filled to capacity without working a hardship on the laborer pushing it.

Synthetic Mortars

GEORGE W. HOFFMANN CORPORATION, New York, N. Y., has announced that it is now distributing synthetic waterproof adhesive masonry mortars to take the place of conventional mortars. It is claimed that the use of these mortars will prevent cracks from developing in concrete block or brick walls.

These mortars, having the trade name of Hoffcrete, are of two types. Type "A" is a white adhesive mortar that can be supplied in any color as well as in any consistency from as thin as buttermilk to that of a caulking compound. Its liquifying vehicle is water, and it dries to a glass-hard white with great adhesive strength and it shrinks in the mortar joint only slightly, according to the manufacturer. Type "B" mortar is of an entirely different composition. It is dark in color, but can be obtained in white and other colors. The liquifying vehicle in this case is a high-flash point naptha, which is about as inflammable as an oil-base paint. This mortar forms an elastic cushion in the mortar joint with a good adhesive bond, and is said to be particularly adaptable for masonry in areas subject to earthquakes or where there is considerable vibration from passing traffic.

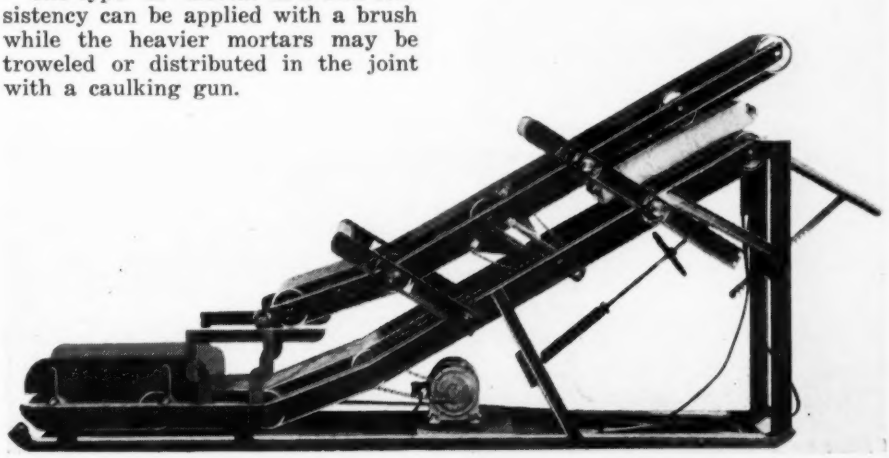
Demonstrating adhesive strength qualities of synthetic mortar joints in concrete masonry

The type "A" mortar in a thin consistency can be applied with a brush while the heavier mortars may be troweled or distributed in the joint with a caulking gun.

Bag Flattener

FLEXOVEYOR MANUFACTURING CO., Denver, Colo., has designed a Flexoveyor or bag flattener which is driven by an electric motor that drives endless steel coil springs running over grooved steel rollers. Due to the rocker arm connection between the hugger boom and lower conveyor, a kneading and pressing action is applied by the hugger boom which eliminates air from the bag and evenly distributes the contents. This action produces a flat, smooth bag which piles easier, stays piled better, and occupies less floor space.

The bag flattener may be equipped with casters or pneumatic tires or it may be equipped with skids. In addition to the bags being flattened as they go through this machine, they are raised above the floor approximately 4 ft. which facilitates transferring to a conveyor system stacking or loading into trucks and box cars.



Mechanism for flattening out bags and stacking them

REDUCE MIXER DOWNTIME

Here's a proved way to triple your liner and mixer blade life

How long do liner plates last in your batch mixer? *Not long enough!*—that's the answer everywhere. Rising production costs are chewing into block plant profits.

Read what one cost-conscious plant operator has done to decrease equipment downtime . . . *increase block output.*

Liner plates wore out every three months . . . had to be replaced four times a year. Today, new liner plates are given a longer lease on life by hard-facing with Coast Metals* alloy before installation. Even after 15 months of continuous duty they are still in good condition.

Can you afford to waste money in needless maintenance costs when these savings can be yours too?

A test will easily determine how much money you can save with Coast Metals Hard-Facing Weld Rod. Regardless of aggregate composition, your liner plates and blades will last AT LEAST THREE TIMES AS LONG when protected with Coast Metals alloys.

Send for our special $3 trial package of rod No. 101 today. Your own plant welder—or any contract welding shop—can easily and quickly do the job. See for yourself *how much longer equipment lasts* when it is protected with Coast Metals alloys.

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Mechanized Plant

(Continued from page 124)

for eight hours. After this period kilns are exhausted of all excess steam by a 15 hp. blower before being cracked. No dry heat is introduced into the kilns. Steam entering the kiln through a single nozzle at ceiling level over the door, is generated by a 250 hp. Farrar-Trefts fire-tube boiler which is coal-fired by a Canton stoker. Automatic controls are used throughout the boiler room, including an automatic stack control on the 4-ft. diameter by 110-ft. high stack. Coal is fed to the stoker by gravity from an overhead bin charged by truck at the same point as aggregate bins.

Cubing Method

Three Towmotor fork trucks, model LT-60, are assigned to the yard for stacking cubes three-high in storage or loading trucks with outgoing orders. These are in addition to the two used in the plant. By the aid of cubing, 100 block per minute are loaded out of the yard. To assure air circulation through cubes of stored block, particularly necessary with the Hugo

Potentiometer for recording heat at points where 12 thermocouples have been installed in the kilns

plant curing cycle, cubes are built so that air has free circulation throughout the entire mass. As shown in the illustrations, three parallel rows of block 8-in. apart are laid in a jig on the floor of the cubing station, after which an ordinary cube four courses high is constructed over the foundation rows. The jig is used for the bottom three rows to assure perfect alignment, thus preventing damage to block.

These cubes are picked up and transported by a Priester fork, consisting of grippers on the inside of the fork tynes that expand with the weight of the cube, gripping the bottom course or rows of block. The top four courses rest on the upper flat side of the forks in the ordinary manner. With this system of cubing, all modular block can be handled in the same manner: 2-, 4-, 6-, 8-, and 12- x 8 x 16-in. Larger block at this plant, 6-, 8-, and 12- x 8- x 16-in., are designed as two-core block. Wooden pallets at the Hugo street plant are used for cubing concrete brick and corner block. On Saturday afternoon, forks are removed from one of the yard

trucks and replaced with a ½-cu. yd. bucket for loading broken block and other debris, including cinders, into dump trucks to be hauled to waste.

Recognizing the advisability of offering the public merchandise under an easily remembered, and if possible, descriptive trade name, Cleveland Builders Supply Co. advertises and sells all products of the Hugo plant as "DurabloX." This trade name appears on the letterheads, invoices, advertising and descriptive pamphlets. A pamphlet, printed on 8- x 11-in. glossy paper, is an interesting piece of promotion literature in that it not only gives dimensions of all block and brick produced at the plant, together with compressive and other test results, but also carries illustrations of all products. These illustrations are more than mere line drawings, being shaded artist's conceptions of various modular block, corner block and brick. H. J. Farr, Jr., is promotional manager at the Hugo plant. Mr. Ehle, in addition to his duties at the block plant, is also production manager at two clay brick and tile plants operated by the parent company.

Officers of Cleveland Builders Supply Co. are: W. T. Rossiter, president; W. H. Crangle, vice-president, general manager; E. S. Barkwill, secretary-treasurer.

Gravity Flow Plant

(Continued from page 119)

from machine to kilns or from kilns to yard storage.

Six kilns arranged in a battery of three facing each other across a roofed, 12-ft. paved apron, provide access to the plant at machine level. Kilns are of cinder block construction, with all outside walls provided with a 1-in. dead air space between double walls of 4- x 8- x 16-in. block. Dimensions of these kilns are: 6-ft. 8-in. high, 13-ft. 8-in. wide, and 35-ft. deep. The roof over the kilns is a cinder concrete slab, with a 1-in. thick layer of Johns-Mansville insulation between it and the built-up roof. Steam, generated by a vertical 100-hp. high-pressure boiler, is introduced into the kilns through a jet at ceiling level over the door to each kiln. Doors are hinged at the roof line and are swung up by a cord and pulley arrangement.

The curing cycle is 2 hrs. setting time; then bring temperature up to 140 deg. F and hold 4 hrs.; then cut off live steam, and soak for 10 hrs.

Cinder block formed on the new machine test at 1140 p.s.i. in 24 hrs. when cured by high pressure; or attain the same crushing strength in three weeks when cured by low pressure. Regular portland cement is used, with provision for storage of special cements when a special order requires it. Bulk cement is delivered by truck.

•

W. S. MOORE has announced plans to establish a pipe manufacturing plant at Boise, Idaho, to supply centrifugal spun concrete pipe for the city's new sewage disposal system.

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Accurate Volumetric Proportioning **and** ***Thorough Mixing*** **not exceeded by any other machine or method.**

Continuous Belt Delivery **of aggregate with remarkable smoothness and accuracy.**

Continuous Delivery of Concrete **in volume to produce upward of 1100—8x8x16 inch blocks or equivalent per hour. (Output variable to meet exact demands of block machine.)**

Low Initial Cost **as compared with machines of similar capacity that lack this machine's several advantages.**

Low Labor Cost. **Except for initial adjustment of output this machine requires only periodic inspection. (Manpower produces elsewhere.)**

Low Power Cost **as this machine requires only 7 H.P. as compared to 40 to 50 H.P. on machines of similar output.**

Low Maintenance Cost **as all main parts operate with exceptional smoothness and freedom from vibrations on pressure lubricated anti-friction bearings.**

Available in RIGHT or LEFT Hand Units adaptable to your plant setup.

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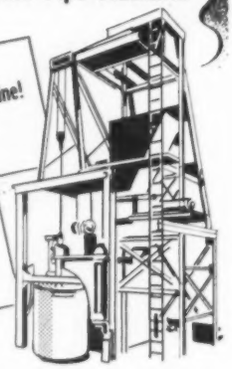

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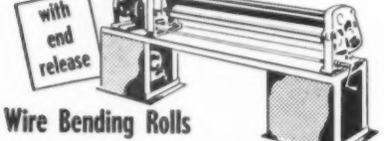

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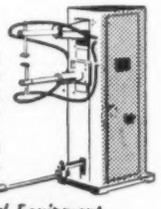

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Pumice Concrete Mixes

(Continued from page 127)

ico, air contents were computed from measured and calculated "air-free" unit weights. Computed air values ranged from 3.5 to 6.5 per cent by volume of the fresh concrete with the higher air contents occurring in the richer mixes.

When air-entraining admixtures are used, air contents are generally much greater. In a few of the mixes tested, as much as 14 per cent has been computed from measured unit weights. The air contained in Pumice mixes is not all entrained air, as such is defined in modern concrete technology as minute, discrete air bubbles. Many of the air bubbles are formed by the rapid absorption of water-cement paste which releases air from the particles.

This effect is greater in coarse than in fine particles and probably accounts for the higher air content of rich mixes as compared to lean mixes when no air-entraining admixture is used. Richer mixes contain a larger volume of coarse particles with respect to total aggregate than do lean mixes.

If enough of these air bubbles are released, they will form a froth or foam which will float to the surface as the mix is worked or vibrated into forms. This creates a surface layer of air, cement, and water that is very difficult to finish. The water films surrounding these bubbles are obviously very thin and their stability low. Thus, when their accumulation at the surface of the concrete is large, a considerable amount of water is released as the bubbles break. It is for this reason, possibly, that all pumice concrete has a tendency to "bleed," and the displacement of air within the mass causes shrinkage.

This air-releasing property of pumice aggregate can be demonstrated by a simple experiment. A sample of the coarse aggregate placed in an ordinary fruit jar pycnometer, covered with water, and allowed to stand undisturbed for 24 hours, will release thousands of tiny air bubbles if the jar is tapped lightly. Samples soaked for periods of ten days to two weeks might show that the particles will contain air, indicating that total absorption is probably never completed in a mix.

If an inexpensive method could be devised to dry pumice aggregate and seal off the permeable pores at the same time, bleeding could be practically eliminated and a much lighter-weight concrete could be produced.

Air-entraining admixtures reduce air and water separation in many cases but must be used with caution. A definite stabilizing effect on the air bubbles can be achieved with a direct benefit to the workability and finishing qualities of the mix. Careful observation and adjustment of the quantity of admixture is essential in controlling workability and strength.

Air content of pumice mixes can be

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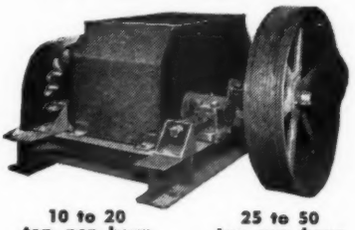

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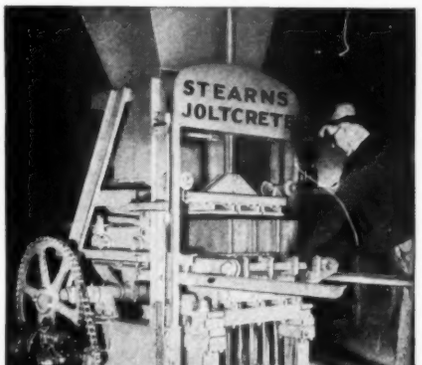

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determined by either the gravimetric or volumetric method. Pressure-type methods can be used but correction factors must be applied which are not always reliable. The most efficient method for adjusting a mix is to determine its unit weight as delivered from the mixer and divide this weight into the batch weight to obtain the yield volume of the batch.

Control of Pumice Mixes

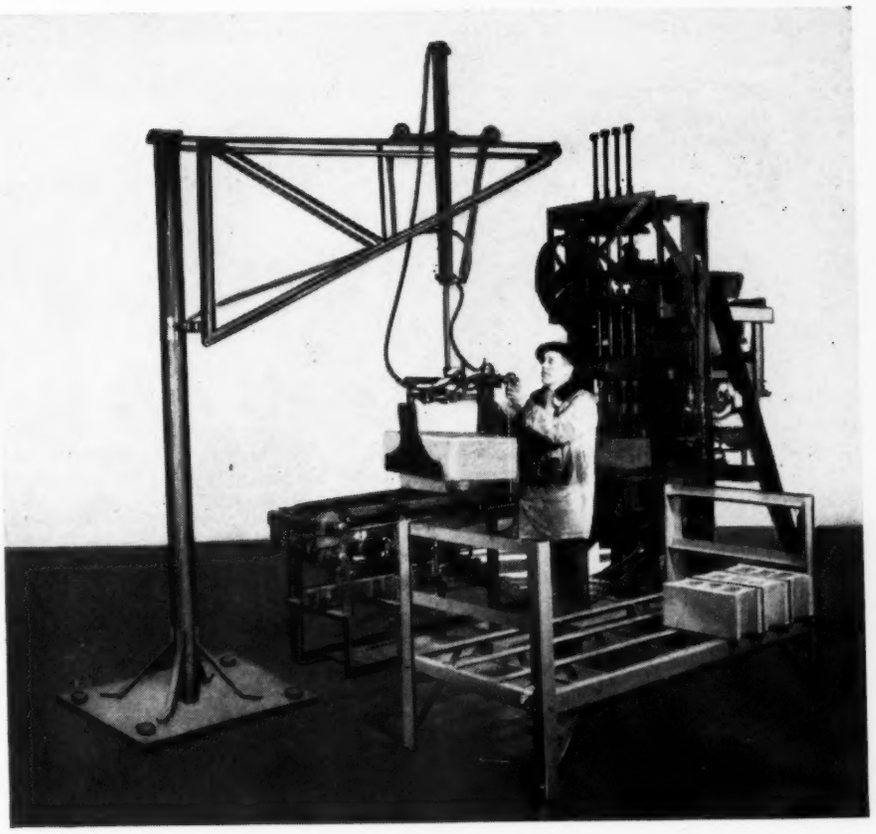
The important control factors for pumice concrete have been discussed previously herein, namely gradation, moisture, and air content, and, with the exception of moisture control, need not be discussed further. Since materials are received at moisture contents below their saturated condition, moisture adjustments are made by drying samples on a hot plate, or in an oven, to constant weight and correcting to a saturated, surface-dry condition. Any displacement method is unsatisfactory for making moisture determinations.

Structural Concrete

Pumice, like many other lightweight aggregates, is being enthusiastically adopted by leading engineers and architects for modern structures. Insulation, low dead weight, resistance to shock, and resistance to salt water-attack have made pumice concrete an ideal material for many types of structures.

Complete data on the structural properties of pumice concrete made from local aggregate is not yet available, however, tests for modulus of elasticity have just been completed by the University of New Mexico. Fig. 4 shows the results of these tests on mixes of plain pumice and those containing natural sand. Modulus of elasticity is plotted against 28-day compressive strength. The curves show that for plain pumice concrete, the modulus of elasticity varies from 750,000 for 1000 p.s.i. concrete to 1,500,000 for 3000 p.s.i. compressive strength. Within the same range of compressive strengths, mixes containing natural sand have moduli from 950,000 to 1,670,000 p.s.i. Recommendations of the Joint Committee for

(Continued on page 138)



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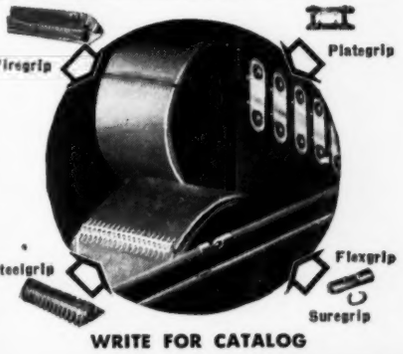

WRITE FOR CATALOG

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Pumice Concrete

(Continued from page 137)

ordinary sand and gravel concrete are also shown for comparison. Modulus values for plain pumice concrete are about one-half of those for ordinary concrete. These values are in substantial agreement with those reported by H. L. Mathews[3] for tests performed on California Pumice.

Values of "n" for pumice concrete vary from 40 for 1000 p.s.i. to 16 for 3,500 p.s.i. as shown in Fig. 4. Thus, for comparative designs, the effect of lower dead weight and lower modulus of elasticity would result in a considerable saving in reinforcing steel.

Regarding other properties, a report of the Pittsburgh Testing Laboratories to the Pumice Aggregate Sales Corporation gives the following values from a series of six mixes made of local materials:

	28-Day Strengths p. s. i.			
	Compressive	Tensile	Flexural	Shear
	1366	262	337	118
	2038	283	340	162
	1972	356	450	288
	2092	351	462	399
	2171	325	418	309
	2494	285	531	189
Averages	2022	310.3	423.0	244.2
%f'c	100.0	15.3	20.9	12.1

As an indication of bond strength of pumice concrete, a Smith-Emery report shows the following relation to compressive strengths:

	No. 1	No. 2
Comprehensive Strength p.s.i...	2565	3278
Bond: Vertical ...	403.9	461.8
Bottom Horizontal.	418.7	537.8
Top Horizontal.	297.0	350.9

Such test data indicates that the designer will be conservative in using values for lightweight concrete recommended in the Joint Committee Report of 1940, Table 7, Section 878.

Conclusions

Pumice concrete has earned its place in the field of lightweight materials. Workable mixes can be designed as easily and with the same scientific approach as ordinary sand and gravel concrete, however, more care must be used in their design and control. When properly graded, handled, and stored, Pumice aggregates offer no greater problem in concrete control than do ordinary sand and gravel aggregates.

While it is true that pumice concrete commands a higher price than ordinary concrete because of higher material and production costs, it is felt that in many cases this is justified by its lighter weight and insulating value.

References

[1] **Bulletin** — Pumice Aggregate Sales Corporation, Test results of Pittsburgh Testing Laboratory.

[2] **Concrete Mix Design** — A Modification of the Fineness Modulus Method, by Myron A. Swayze and Ernst Gruenwald, Journal A.C.I., Vol. 18, No. 7, Pg. 829.

[3] **Prefabricated Pumice Concrete Houses**, by H. L. Mathews, Journal A.C.I., Vol. 19, No. 9, Pg. 797.

Concrete Roofs For French Roundhouses

THIN-SHELL CONCRETE ROOFS are used for roundhouses being built by the French National Railways as part of the railway's general rebuilding program. Spanning 75 ft. 6 in., a curved, reinforced concrete slab only 3¼-in. thick forms the roofs of the circular engine houses.

The shell is stiffened radially by hollow ribs, which also serve as ducts to convey smoke outside the building, and is supported on three concentric rings of concrete columns. At the tops of the main columns are circumferential concrete beams that carry the cast-in-place roof slab which covers a circular strip about 115 ft. wide leaving the central area exposed.

MARMET BLOCK CO., Marmet, W. Va., has been organized by William T. Homberg, Geraldine DeBolt and J. D. Preston.

LEMCKE CONCRETE PRODUCTS CO., Carson, N. D., has installed a gravel washing machine at its sand pit, Carl Lemcke, manager, announced. Capacity of the machine is 500 tons per day.

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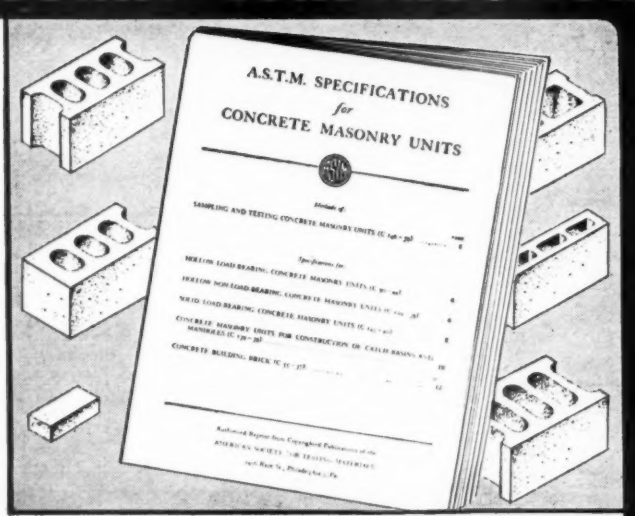

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